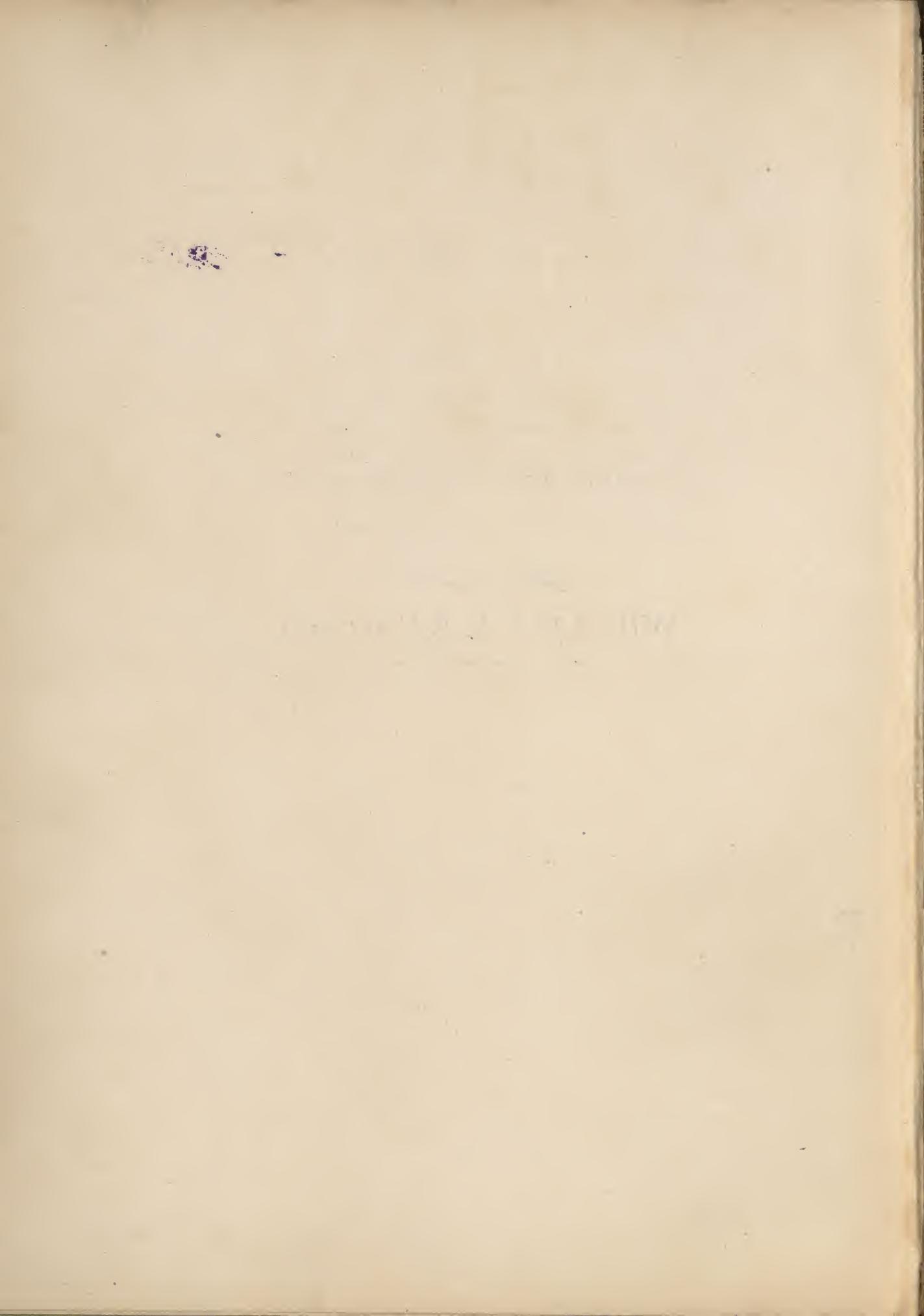


RADFORD'S GARAGES

AND HOW TO BUILD THEM



BUILDING PLANS OF
PRIVATE AND PUBLIC GARAGES



Radford's Garages

and How to Build Them

R. Radford Longfellow
A STANDARD COLLECTION OF

NEW, ORIGINAL, AND ARTISTIC DESIGNS FOR UP-TO-DATE PRIVATE
AND PUBLIC GARAGES ADAPTED TO FRAME, BRICK, STONE,
CEMENT, STUCCO, OR CONCRETE CONSTRUCTION
TOGETHER WITH ESTIMATES OF COST

Selected and Compiled by

WILLIAM A. RADFORD

President of the Radford Architectural Company, Chicago, Ill.; Editor-in-Chief of
"Radford's Cyclopedia of Construction," "American Carpenter
and Builder," "Cement World," etc.

Every Plan Designed and Executed by a Corps of

LICENSED ARCHITECTS OF THE HIGHEST PROFESSIONAL STANDING
ASSISTED BY A STAFF OF EXPERT DRAFTSMEN

FIFTY-FIVE DESIGNS

Covering a Great Variety of Types Economical in Cost, Adapted to the Various Requirements of Up-to-Date
Construction and the Latest Approved Materials Used in Modern Building Practice,
and Representative of the Best Developments in this
New Branch of Architectural Art

THE RADFORD ARCHITECTURAL COMPANY

185 E. JACKSON BLVD.
CHICAGO, ILL.

178 FULTON STREET
NEW YORK, N. Y.

1910

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Radford's Garages

and How to Build Them

AS a factor in the evolution of business and social life, the automobile, or self-propelled power-driven vehicle, is already playing a part as spectacular and important as did its predecessor, the bicycle. While it is probable, on account of its cost, that the automobile, for purposes of pleasure and social intercourse, will always be classed as a "luxury" and its use confined to those who might be designated as the "well-to-do," yet for business purposes the facilities it affords are coming more and more to be looked upon as a "necessity" even for those of moderate means; and in this connection it is destined to play a part of continually increasing importance as a great modern convenience and a much-needed supplement to any business equipment.

At the present time, the increasing popularity of the motor vehicle—or "horseless carriage," as it was first called—is perhaps most apparent among people living in suburban towns and in the outlying districts of the larger commercial centers; but even in the crowded business sections it is much in evidence, and is the basis of a distinctly new line of commercial activity—that of the erection and maintenance of special structures for the safe housing and storing of automobiles and meeting the fluctuations of supply and demand for the conveniences that these afford. These buildings are known as **garages**—a term of French origin—and they range from the simplest type of protective enclosure to very costly structures fitted with elaborate details of accessories and equipment.

In the following pages we illustrate nearly sixty garage designs covering many different types of construction in wood, frame, brick, stone, cement stucco, and concrete, as well as various examples in which these materials are artistically and advantageously combined. The cost of constructing these buildings will, of course, vary in different parts of the country and with varying conditions in the local market, so that the estimated cost as indicated in each case can be regarded only as approximate. These costs, however, have been carefully and conservatively estimated, and represent as close an approximation to average cost conditions for materials and labor as it is possible to make.

The small private garages range in cost from \$400 to \$2,000; larger private garages, up to \$3,000; while the larger public garages, equipped with the latest approved modern accessories and conveniences, run in cost from \$3,000 up to \$11,000.

Even a brief and hurried examination will show that the garages illustrated embody a wide diversity of design. This is done deliberately, since taste in building these structures is as varied as in any other field. In all cases, however, the designs

have been made with reference to convenience and economy, and no pains or expense has been spared in their preparation.

Every design shown is the work of a skilled architect of experience, who is thoroughly familiar with modern requirements. During the many months that this volume has been in preparation, it has received the benefit of the most careful attention, and many designs have been rejected to make place for others that were considered better. In a word, the present collection is the best that could be secured.

The special purpose in presenting this work to the public at this time, is to make more easy the problem of garage construction for the dweller in rural communities, in small towns, and in cities, for there are designs here that will be found adapted to any community.

A man who builds a garage, just as truly as one who is putting up a residence, owes a duty not alone to his family and himself; he is under a moral obligation to the community as well. No man has a moral right to build a structure which will be unworthy of the community in which he lives, or which, by its inappropriateness or utter lack of style, will tend to depreciate the value of property in the neighborhood. In garage building, as in all other things in which men engage, the purpose should be improvement and betterment. So we advocate only a structure built from accurately drawn plans—one having individuality of style, and harmonizing with its surroundings.

No greater calamity in a material way can befall an owner than to discover, when a structure is complete, that it is faulty in arrangement or in appearance. This is apt to be the case with a building erected without plans. On the other hand, a building worthy of the neighborhood is a source of constant joy and satisfaction.

Let us impress upon your mind one vital thing. **NEVER** build a garage without plans to work from. It is hardly necessary to tell you that no more foolish thing is ever done by a man than to try to build without plans, or—which is just about as bad—from rough pencil sketches. We could show you in our files thousands of letters from persons who have ordered plans after failing miserably in their efforts to build without accurate drawings. Here are some of the things that happen to the man who tries to build without plans: His structure lacks style, that peculiarly pleasing aspect that is possible only in a building constructed from an accurate design. He wastes materials. He wastes the time of his workmen. He wastes nervous energy in worry over mistakes; and, when the structure is done, if it ever be, he has a monstrosity that is a constant source of annoyance and dissatisfaction.

Every design in this volume is drawn with a faithful regard for mathematical accuracy, and there is no error to bother the builder. It is safe to say that the saving in materials that will result from building after any of these plans will more than pay the price asked for them. So be sure you start right—build only from accurately drawn plans.

We Illustrate in this Book the perspective view and floor plans of nearly 60 garages of various cost. In the preparation of this work great care has been exercised in the selection of original, practical and attractive garage designs, such as seventy-five to ninety per cent of the people to-day wish to build. In drawing these plans special effort has been made to provide for the MOST ECONOMICAL CONSTRUCTION, thereby giving the home builder and contractor the benefit of the saving of many dollars; for in no case have we put any useless expense upon the building simply to carry out some pet idea. Every plan illustrated will show, by the complete working plans and specifications, that we give you designs that will work out to the best advantage and will give you the most for your money; besides every bit of space has been utilized to the best advantage.

\$100.00 Plans for only \$10.00 This department has for its foundation the best equipped architectural establishment ever maintained for the purpose of furnishing the public with complete working plans and specifications at the remarkably low price of only \$7.00 to \$15.00 per set. Every plan we illustrate has been designed by a licensed architect, who stands at the head of his profession in this particular class of work and has made a specialty of low and medium-priced houses. The price usually charged for this work is from \$75.00 to \$100.00.

What We Give You The first question you will ask is, "What do we get in these complete working plans and specifications? Of what do they consist? Are they the cheap printed plans on tissue paper without details or specifications?" We do not blame you for wishing to know what you will get for your money.

Blue Printed Working Plans The plans we send out are the regular blue printed plans, drawn one-quarter inch scale to the foot, showing all the elevations, floor plans and necessary interior details. All of our plans are printed by electricity on an electric circular blue-printing machine, and we use the very best grade of electric blue-printing paper; every line and figure showing perfect and distinct.

Foundation and Cellar Plans This sheet shows the shape and size of all the walls, piers, footings, posts, etc., and of what materials they are constructed; shows the location of all windows, doors, chimneys, ash-pits, partitions, and the like. The different wall sections are given, showing their construction and measurements from all the different points.

Floor Plans These plans show the shape and size of all rooms, halls and closets; the location and size of all doors and windows; the position of all plumbing fixtures, gas lights, registers, pantry work, etc., and all the measurements that are necessary are given.

Elevations A front, right, left and rear elevation are furnished with all the plans. These drawings are complete and accurate in every respect. They show the shape, size and location of all doors, windows, porches, cornices, towers, bays, and the like; in fact, give you an exact scale picture of the house as it should be at completion. Full wall sections are given, showing the construction from foundation to roof, the height of stories between the joists, height of plates, pitch of roof, etc.

Roof Plan This plan is furnished where the roof construction is at all intricate. It shows the location of all hips, valleys, ridges, decks, etc. All the above drawings are made to scale one-quarter inch to the foot.

Details All necessary details of the interior work, such as door and window casings and trim, base, stools, picture moulding, doors, newel posts, balusters, rails, etc., accompany each set of plans. Part is shown in full size, while some of the larger work, such as stair construction, is drawn to a scale of one and one-half inch to the foot. These blue-prints are substantially and artistically bound in cloth and heavy water-proof paper, making a handsome and durable covering and protection for the plans.

Specifications The specifications are typewritten on Lakeside Bond Linen paper, and are bound in the same artistic manner as the plans, the same cloth and water-proof paper being used. They consist of twenty-two pages of closely typewritten matter, giving full instructions for carrying out the work. All necessary directions are given in the clearest and most explicit manner, so that there can be no possibility of a misunderstanding.

Basis of Contract The working plans and specifications we furnish can be made the basis of contract between the home builder and the contractor. This will prevent mistakes, which cost money, and they will prevent disputes which are unforeseen and never settled satisfactorily to both parties. When no plans are used the contractor is often obliged to do some work he did not figure on, and the home builder often does not get as much for his money as he expected, simply because there was no basis on which to work and upon which to base the contract.

No Misunderstanding Can Arise when a set of our plans and specifications is before the contractor and the home builder, showing the interior and exterior construction of the house as agreed upon in the contract. Many advantages may be claimed for the complete plans and specifications. They are time savers, and, therefore, money savers. Workmen will not have to wait for instructions when a set of plans is left on the job. They will prevent mistakes in cutting lumber, in placing door and window frames, and in many other places where the contractor is not on the work and the men have received only partial or indefinite instructions. They also give instructions for the working of all material to the best advantage.

Free Plans for Fire Insurance Adjustment You take every precaution to have your house covered by insurance; but do you make any provision for the adjustment of the loss, should you have a fire? There is not one man in ten thousand who will provide for this embarrassing situation. You can call to mind instances in your own locality where settlements have been delayed because the insurance companies wanted some proof which could not be furnished. They demand proof of loss before paying insurance money, and they are entitled to it. We have provided for this and have inaugurated the following plan, which cannot but meet with favor by whoever builds a house from our plans.

Immediately Upon Receipt of Information from you that your house has been destroyed by fire, either totally or partially, we will forward you, free of cost, a duplicate set of plans and specifications, and in addition we will furnish an affidavit giving the number of the design and the date when furnished, to be used for the adjustment of the insurance.

Without One Cent of Cost to You and without one particle of trouble. We keep a record of the number of the house design and the date it was furnished, so that, in time of

loss, all it will be necessary for you to do is to drop us a line and we will furnish the only reliable method of getting a speedy and satisfactory adjustment. This may be the means of saving you hundreds of dollars, besides much time and worry.

Our Liberal Prices Many have marveled at our ability to furnish such excellent and complete working plans and specification at such low prices. We do not wonder at this, because we charge but \$7.00 to \$15.00 for a more complete set of working plans and specifications than you would receive if ordered in the ordinary manner, and when drawn especially for you, at a cost of from seventy-five to one hundred dollars. On account of our large business and unusual equipment, and owing to the fact that WE DIVIDE THE COST of these plans among so many, it is possible for us to sell them at these low prices. The margin of profit is very close, but it enables us to sell thousands of sets of plans, which save many times their cost to both the owner and the contractor in erecting even the smallest dwelling.

Our Guarantee Perhaps there are many who feel that they are running some risk in ordering plans at a distance. We wish to assure our customers that there is no risk whatever. If, upon receipt of these plans, you do not find them exactly as represented, if you do not find them complete and accurate in every respect, if you do not find them as well prepared as those furnished by any architect in the country, or any that you have ever seen, we will refund your money upon the return of the plans from you in perfect condition. All of our plans are prepared by architects standing at the head of their profession, and the standard of their work is the very highest. We could not afford to make this guarantee if we were not positive that we were furnishing the best plans put out in this country, even though our price is not more than one-seventh to one-tenth of the price usually charged.

Bill of Material We do not furnish a bill of material. We state this here particularly, as some people have an idea that a bill of material should accompany each set of plans and specifications. In the first place, our plans are gotten up in a very comprehensive manner, so that any carpenter can easily take off the bill of material without any difficulty. We realize that there are hardly two sections of the country where exactly the same kinds of materials are used, and, moreover, a bill which we might furnish would not be applicable in all sections of the country. We furnish plans and specifications for houses which are built as far north as the Hudson Bay and as far south as the Gulf of Mexico. They are built upon the Atlantic and Pacific Coasts, and you can also find them in Australia and South Africa. Each country and section of a country has its peculiarities as to sizes and qualities; therefore, it would be useless for us to make a list that would not be universal. Our houses, when completed, may look the same whether they are built in Canada or Florida, but the same materials will not be used, for the reason that the customs of the people and the climatic conditions will dictate the kind and amount of materials to be used in their construction.

Estimated Cost It is impossible for anyone to estimate the cost of a building and have the figures hold good in all sections of the country. We do not claim to be able to do it. The estimated cost of the houses we illustrate is based on the most favorable conditions in all respects, and includes everything but the plumbing and heating. We are not familiar with your local conditions, and, should we claim to know the exact cost of a building in your locality, a child would know that our statement was false. We leave this matter in the hands of the reliable contractors, for they, and they alone, know your local conditions.

We Wish to be Frank With You

and therefore make no statement that we cannot substantiate in every respect. If a plan in this book pleases you; if the arrangement of the rooms is satisfactory, and if the exterior is pleasing and attractive, then we make this claim—that it can be built as cheaply as if any other architect designed it, and we believe cheaper.

We Have Studied Economy

in construction, and our knowledge of all the material that goes into a house qualifies us to give you the best for your money. We give you a plan that pleases you, one that is attractive, and one where every foot of space is utilized at the least possible cost. Can any architect do more, even at seven to ten times the price we charge you for plans?

Reversing Plans

We receive many requests from our patrons for plans exactly according to the designs illustrated, with the one exception of having them reversed or placed in the opposite direction. It is impossible for us to make this change and draw new plans, except at a cost of about eight times our regular price. We see no reason why our regular plans will not answer your purpose. Your carpenter can face the house exactly as you wish it, and the plans will work out as well facing in one direction as in another. We can, however, if you wish, and so instruct us, make you a reversed blue-print and furnish it at our regular price; but in that case all the figures and letters will be reversed, and, therefore, liable to cause as much confusion as if your carpenter reversed the plan himself while constructing the house.

We Would Advise

however, in all cases where the plan is to be reversed, and there is the least doubt about the contractor not being able to work from the plans as we have them, that two sets of blue-prints be purchased, one regular and the other reversed, and in such cases we will furnish two sets of blue-prints and one set of specifications for only fifty per cent added to the regular cost, making the \$10.00 plan cost only \$15.00.

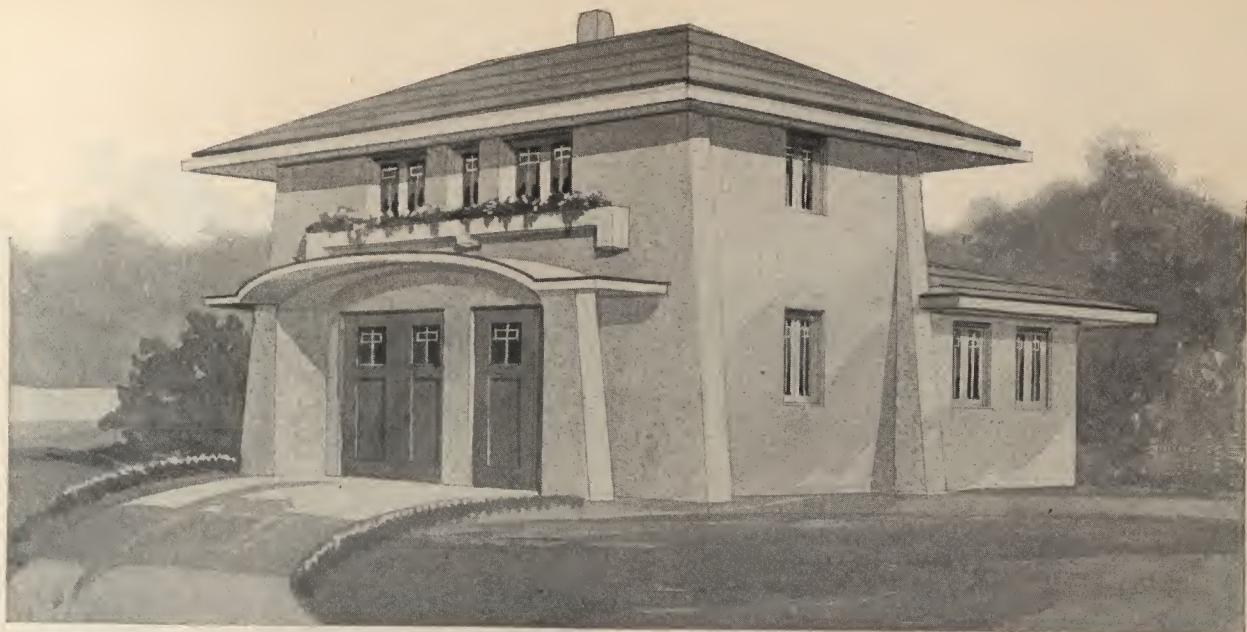
Immediate Delivery Guaranteed

Our equipment and facilities are such that we can send out the same day we receive order the complete plans and specifications for any house we illustrate. Delivery is made by express whenever possible, otherwise plans and specifications are forwarded by mail.

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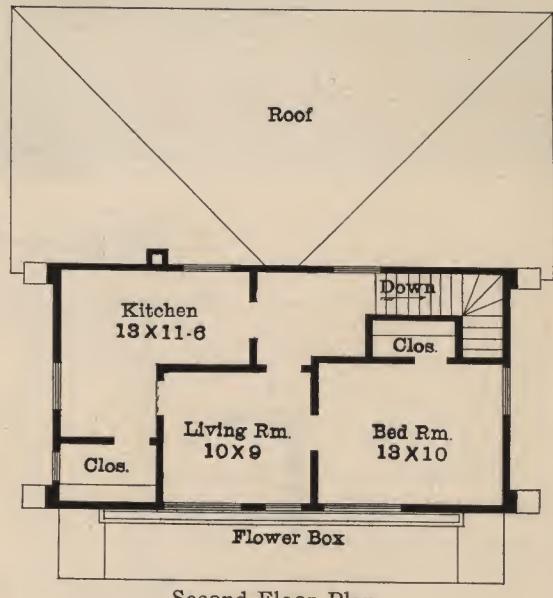
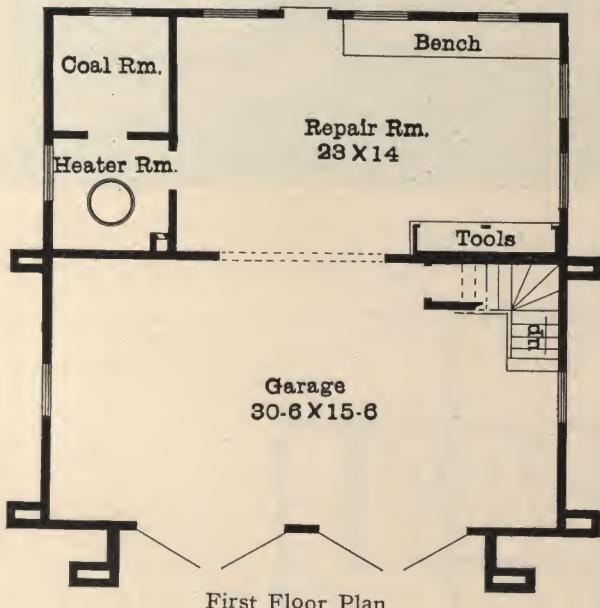
The Radford Architectural Co.

185 E. Jackson Boulevard, Chicago, Illinois



Design No. G-152

SIZE: Width, 36 feet; Length, 35 feet.



PRICE

of Blue Prints, together with a complete set of typewritten specifications,

ONLY

\$15.00

We mail plans and specifications the same day order is received.

Artistic design for two-story private garage to be built of stucco. Lower floor is devoted entirely to the storage of machines, work room, coal room and heater room. The second floor contains the living quarters for the chauffeur. The pleasing features of this design is the wide cornices and the flower box over the front entrance. The estimated cost of construction is from about \$2,200.00 to about \$2,500.00.



Design No. G-122

Size: Width, 33 feet; Length, 22 feet

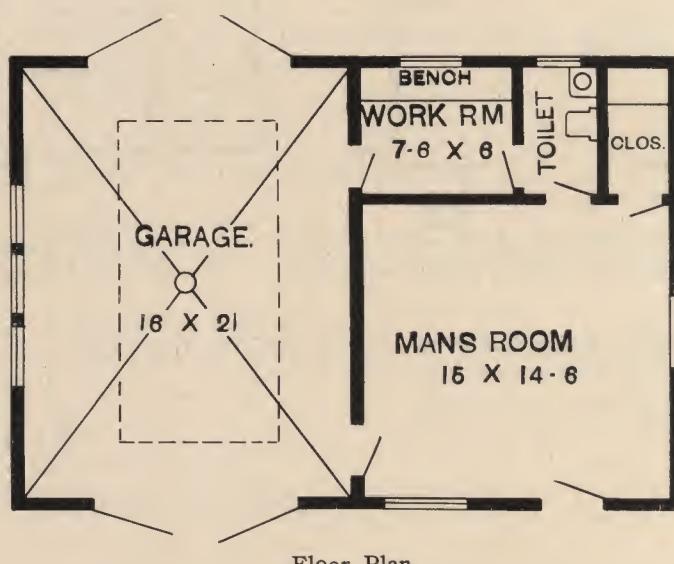
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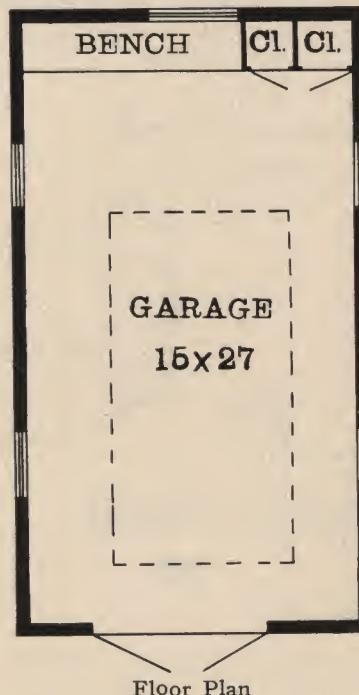
Blue Prints consist of front, rear, two side elevations; wall sections and all necessary details. Specifications are typewritten and contain all the information necessary for the proper construction of the building.

Artistic design for private garage of frame with plastered exterior. Estimated cost of construction from about \$800.00 to about \$900.00.



Design No. G-102

Size: Width, 16 feet; Length, 28 feet



Blue Prints consist of floor plan; front, rear, two side elevations; wall sections and all necessary details. Specifications are typewritten and contain all the information necessary for the proper construction of the building.

PRICE

of Blue Prints, together with a complete set of typewritten specifications,

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\$5.00

We mail plans and specifications the same day order is received.

Neat design for small frame garage, suitable for city lot. Estimated cost of construction from about \$350.00 to about \$400.00.



Design No. G-115

Size: Width, 40 feet; Length, 27 feet

Blue Prints consist of Floor Plans; front, rear, two side elevations and all necessary details. Specifications are typewritten and contain all the information necessary for the proper construction of the building.

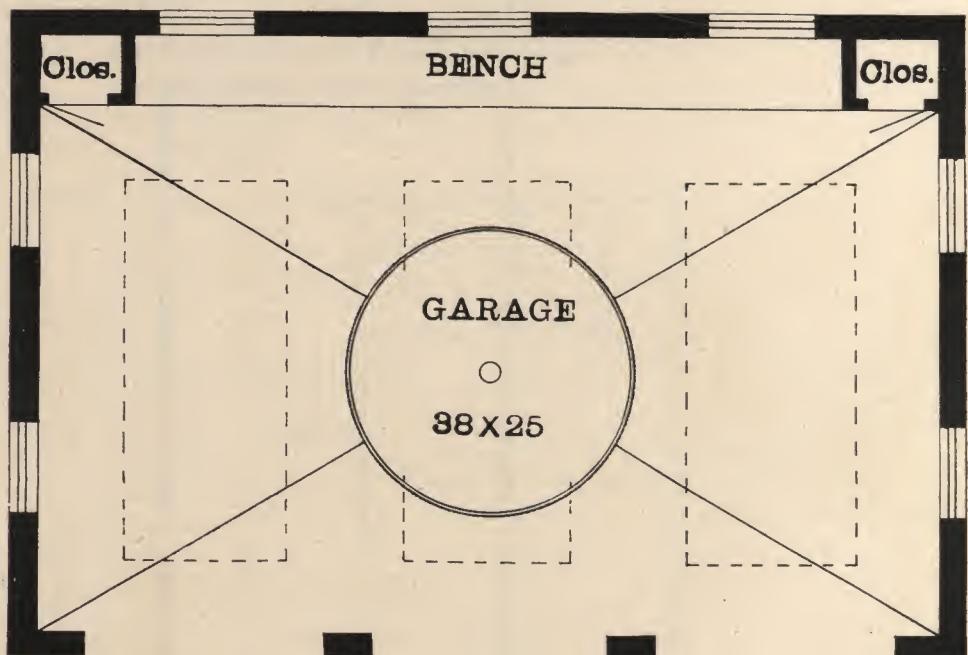
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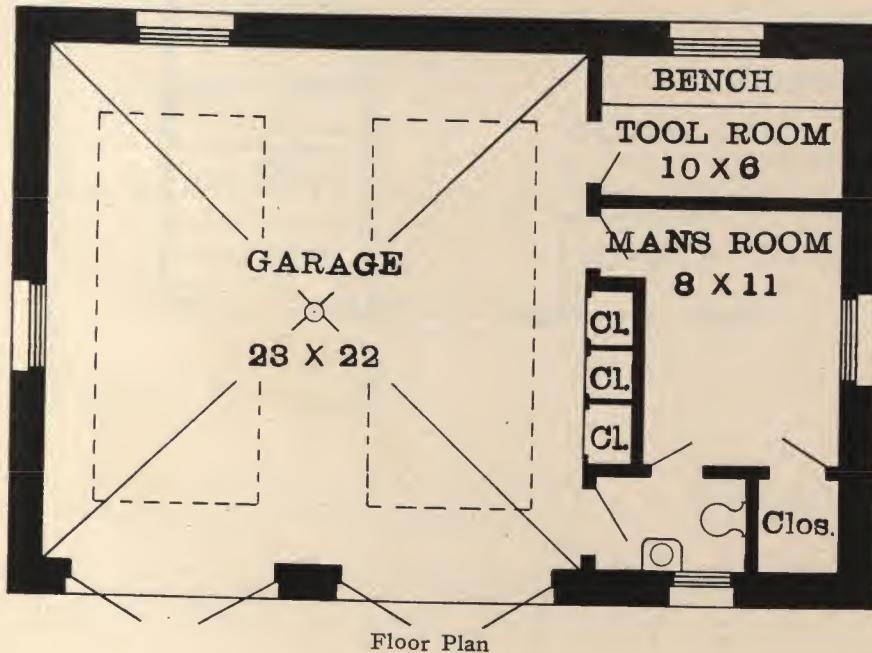
Floor Plan

Attractive design for Concrete Garage for private estate. Sufficient room for three large machines. The large turntable in the center is equipped with drain. The work bench is located at the rear with closets at the ends for the storing of supplies, etc. Estimated cost of construction from about \$950.00 to about \$1,050.00.



Design No. G-100

Size: Width, 36 feet; Length, 25 feet



Blue Prints consist of floor plan; front, rear, two side elevations; wall sections and all necessary details. Specifications are typewritten and contain all the information necessary for the proper construction of the building.

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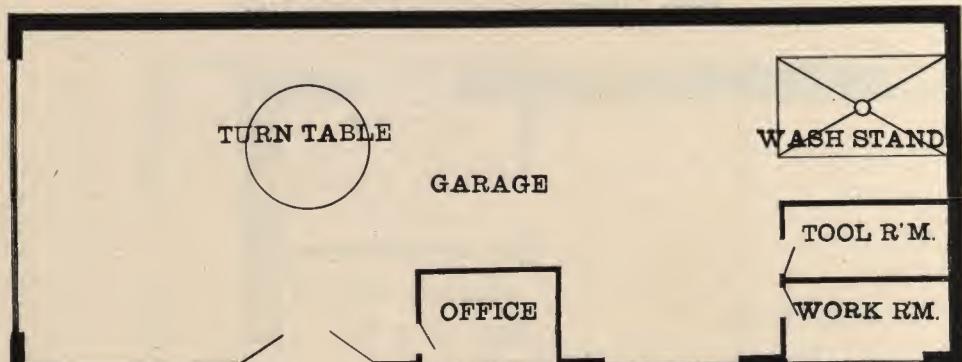
We mail plans and specifications the same day order is received.

Artistic Design for Private Garage of stone construction with accommodations for two machines. Estimated cost of construction from about \$750.00 to about \$850.00.



Design No. G-130

SIZE: Width, 40 feet; Length, 105 feet.



Floor Plan

PRICE

of Blue Prints, together with complete set of type-written specifications,

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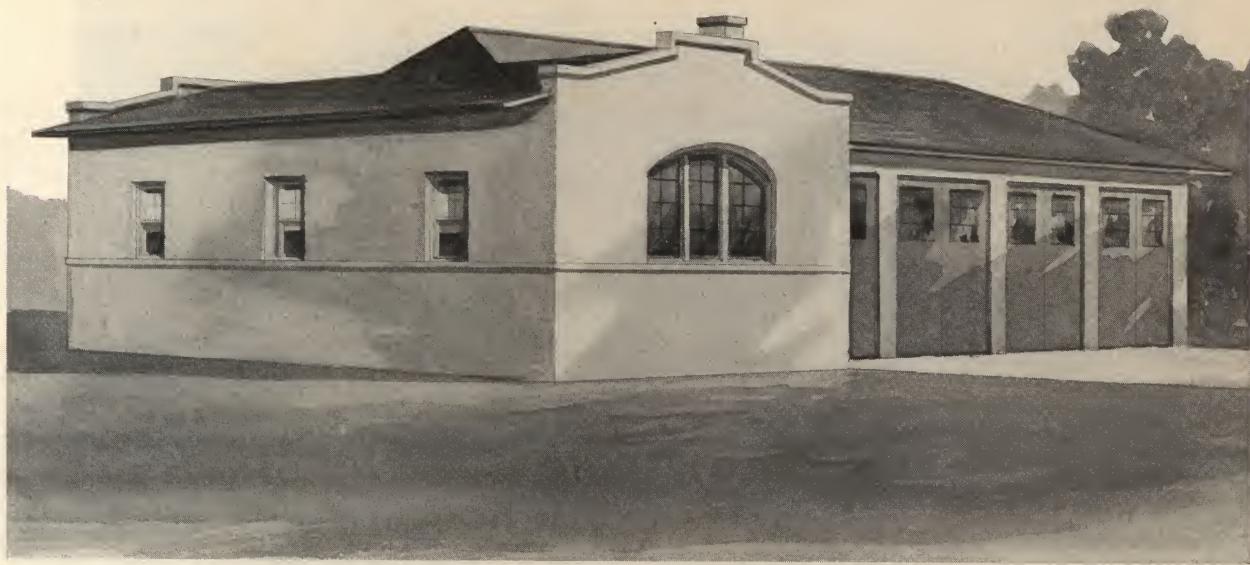
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Blue Prints consist of floor plan; front, rear, two side elevations; wall sections and all necessary details.

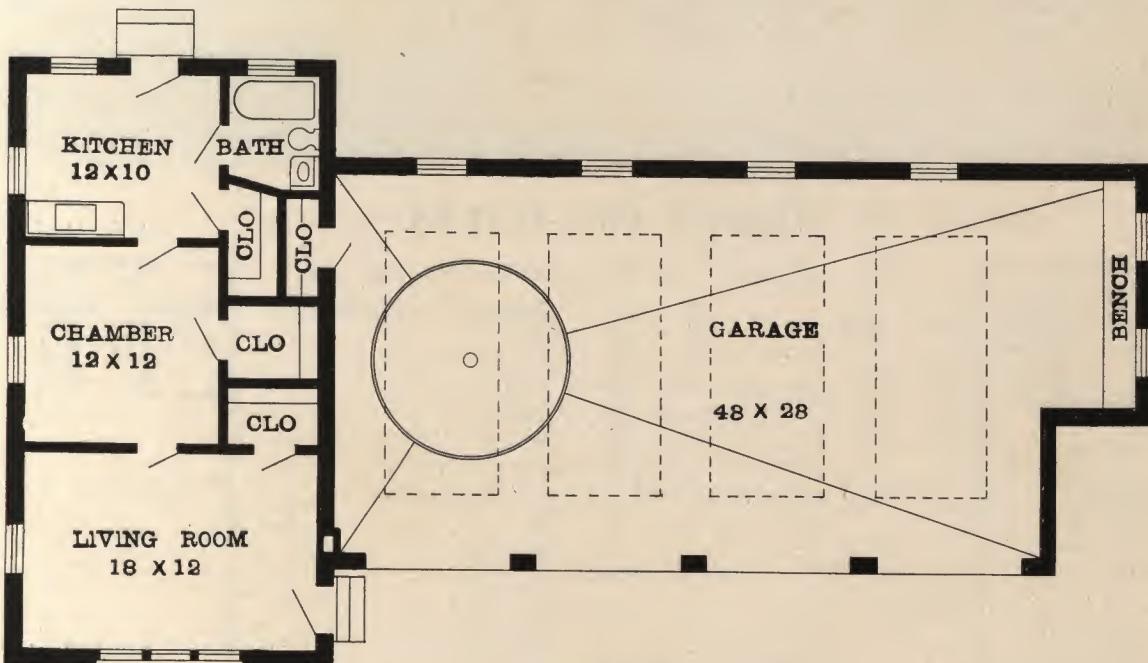
Specifications are typewritten and contain all the information necessary for the proper construction of the building.

Very artistic design for public garage of brick construction. Designed especially for corner lot with display windows on both streets. Estimated cost of construction from about \$4,000.00 to about \$4,800.00.



Design No. G-106

Size: Width, 70 feet; Length, 37 feet.



Floor Plan

Blue Prints consist of Floor Plans; front, rear, two side elevations; wall sections and all necessary details. Specifications are typewritten and contain all the information necessary for the proper construction of the building.

Practical design for concrete garage suitable for large private estate. The garage proper will accommodate four machines. At the left is located the living quarters for chauffeur consisting of living room, chamber, kitchen, bath, closets, etc. The estimated cost of construction is from about \$2,500.00 to about \$3,000.00.

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Design No. G-133

Size: Width, 37 feet 6 inches; Length, 100 feet

Blue Prints consist of first and second floor plans; front, rear, two side elevations; wall sections and all necessary details. Specifications are typewritten and contain all the information necessary for the proper construction of the building.

PRICE

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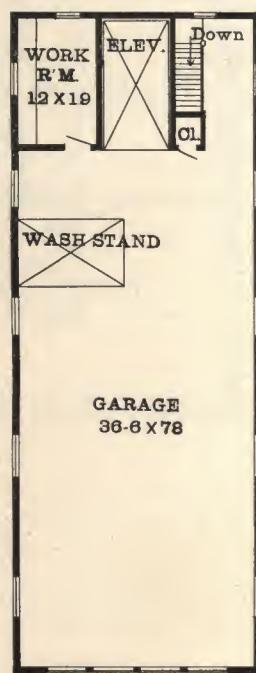
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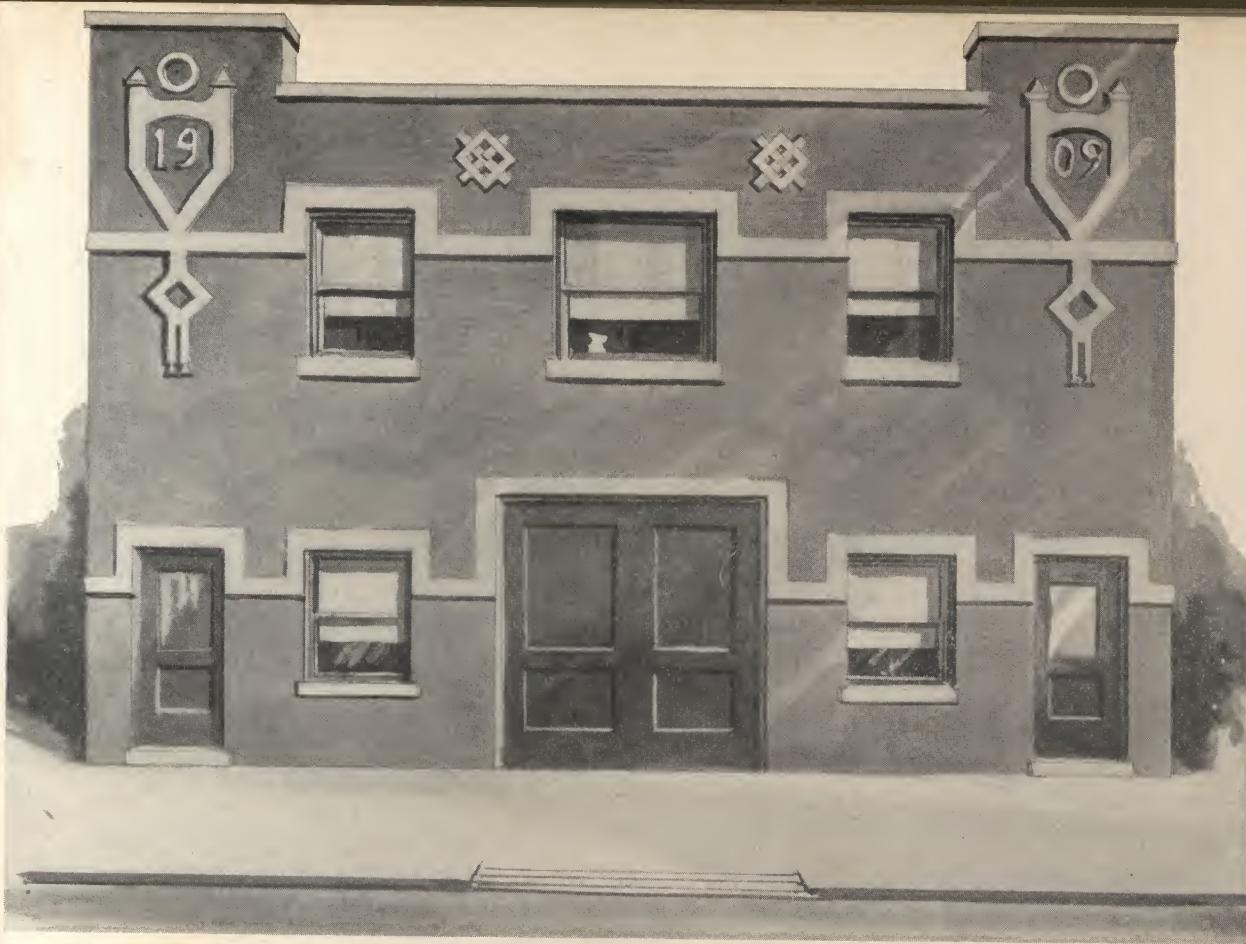


First Floor Plan



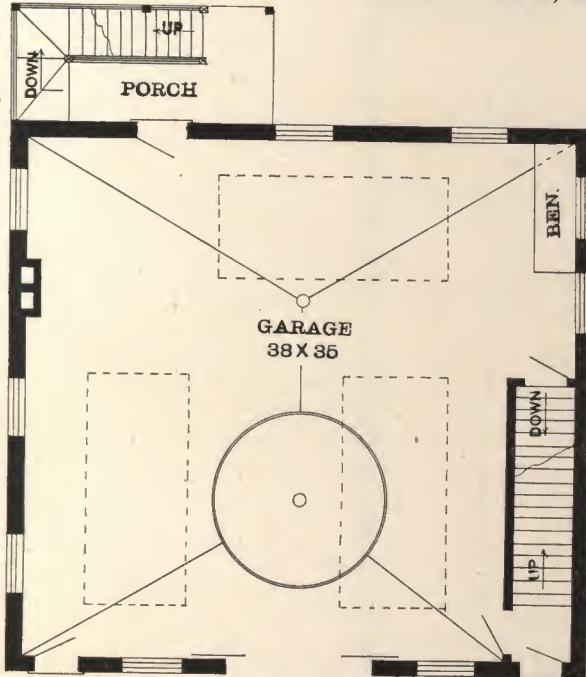
Second Floor Plan

Attractive design for large city garage, two story, of brick construction, both floors being devoted to the storing of machines. Wash stand and workroom on each floor. Estimated cost of construction from about \$5,000.00 to about \$5,500.00.

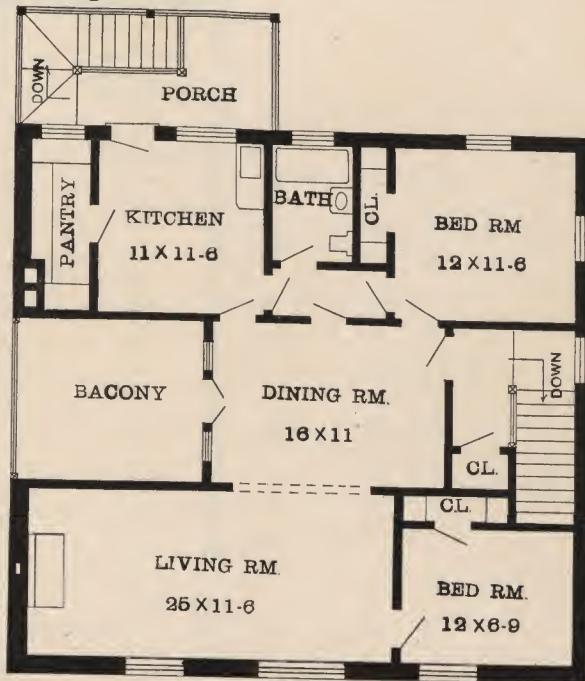


Design No. G-111

SIZE: Width, 40 feet; Length, 38 feet.



First Floor Plan



Second Floor Plan

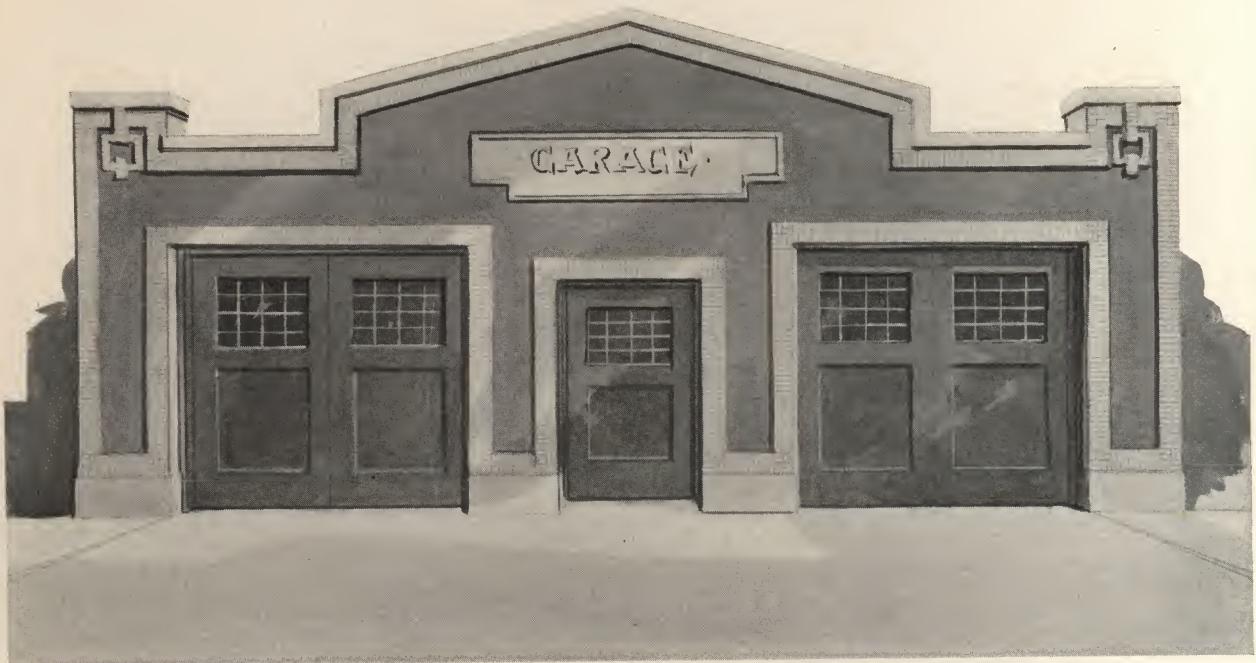
Blue Prints consist of first and second floor plans; Front, Rear, two-side elevations; wall sections and all necessary details. Specifications are typewritten and contain all the information necessary for the proper construction of the building.

Price of Blue Prints, together with complete set of Typewritten Specifications,

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Artistic Design for a city garage of brick construction. The lower floor is arranged so that it will easily accommodate three machines and has large turntable with center drain. The second floor is designed for living quarters having living room, dining room, two bed rooms, kitchen, bath, pantry, closets, etc. Estimated cost of construction from about \$2,800.00 to about \$3,000.00.



Design No. G-134

SIZE: Width, 37 feet; Length, 50 feet.

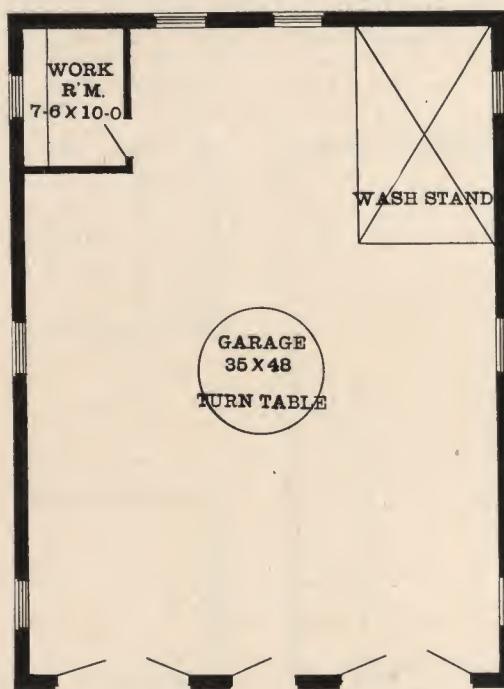
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of Blue Prints, together with a complete set of typewritten specifications,

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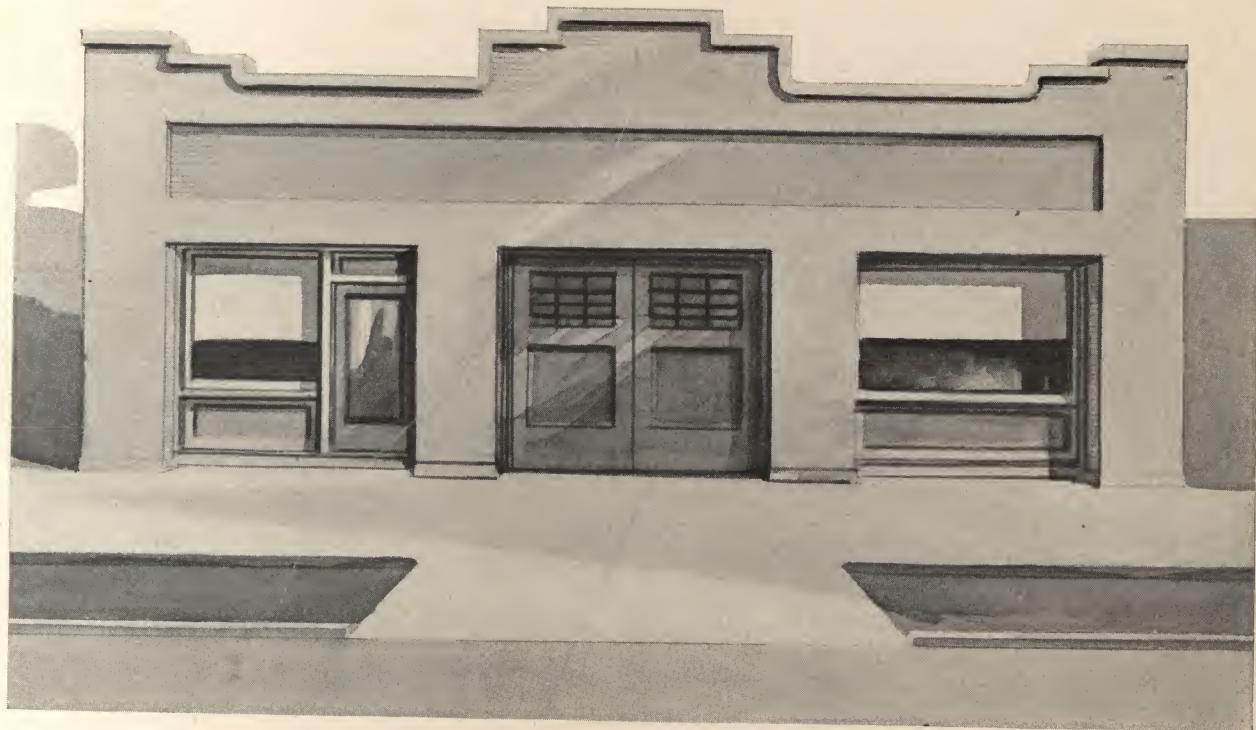
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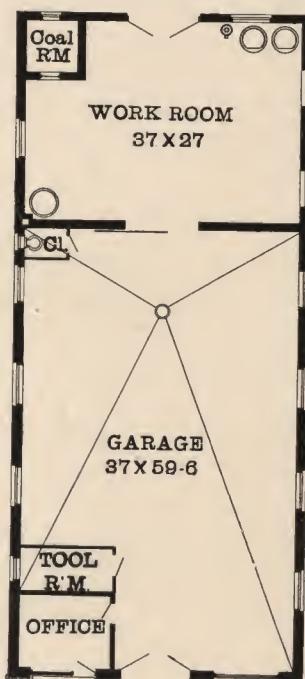
Floor Plan

Neat and attractive design for brick garage, suitable for city or village. Has turn-table in the center, while the wash-stand and work-room are located in the rear, leaving the balance of the floor space free for the storage of machines. Estimated cost of construction from about \$2,000.00 to about \$2,500.00.



Design No. G-135

Size: Width, 40 feet; Length, 90 feet



Floor Plan

Very pleasing design for small public garage of brick construction, with office and tool room located at the left, and large work room in the rear. Estimated cost of construction from about \$3,300.00 to about \$3,500.00.

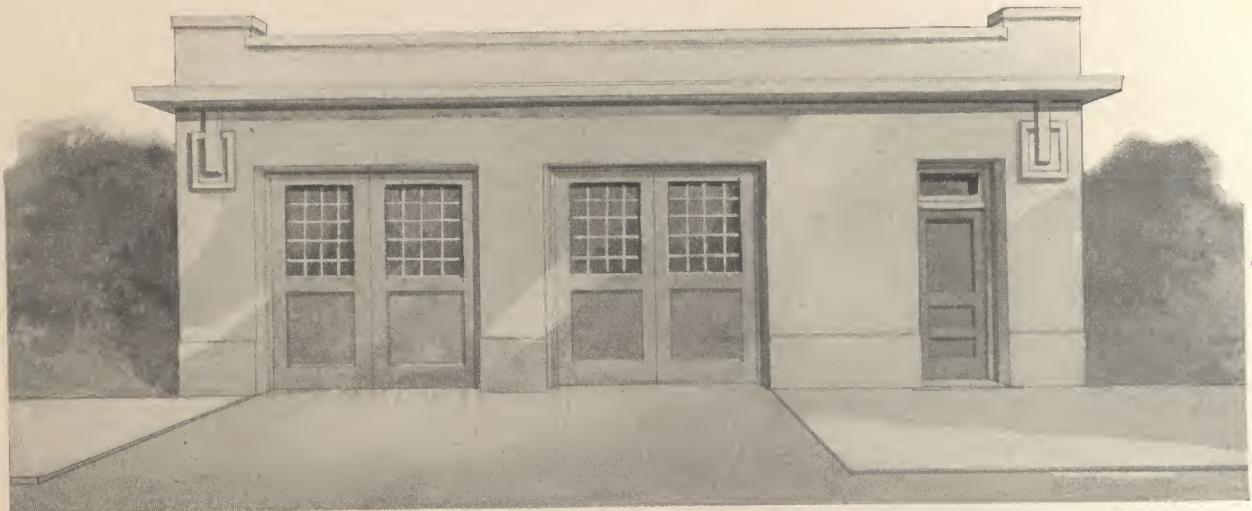
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Design No. G-150

SIZE: Width, 34 feet; Length, 24 feet.

Blue Prints consist of floor plans; front, rear, two side elevations; wall sections and all necessary details. Specifications are typewritten and contain all the information necessary for the proper construction of the building.

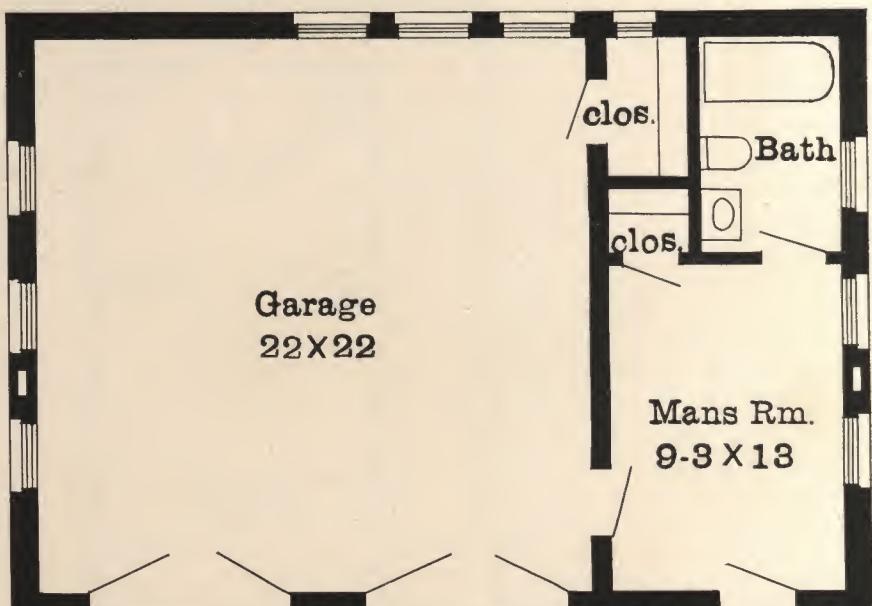
PRICE

of Blue Prints, together with a complete set of typewritten specifications,

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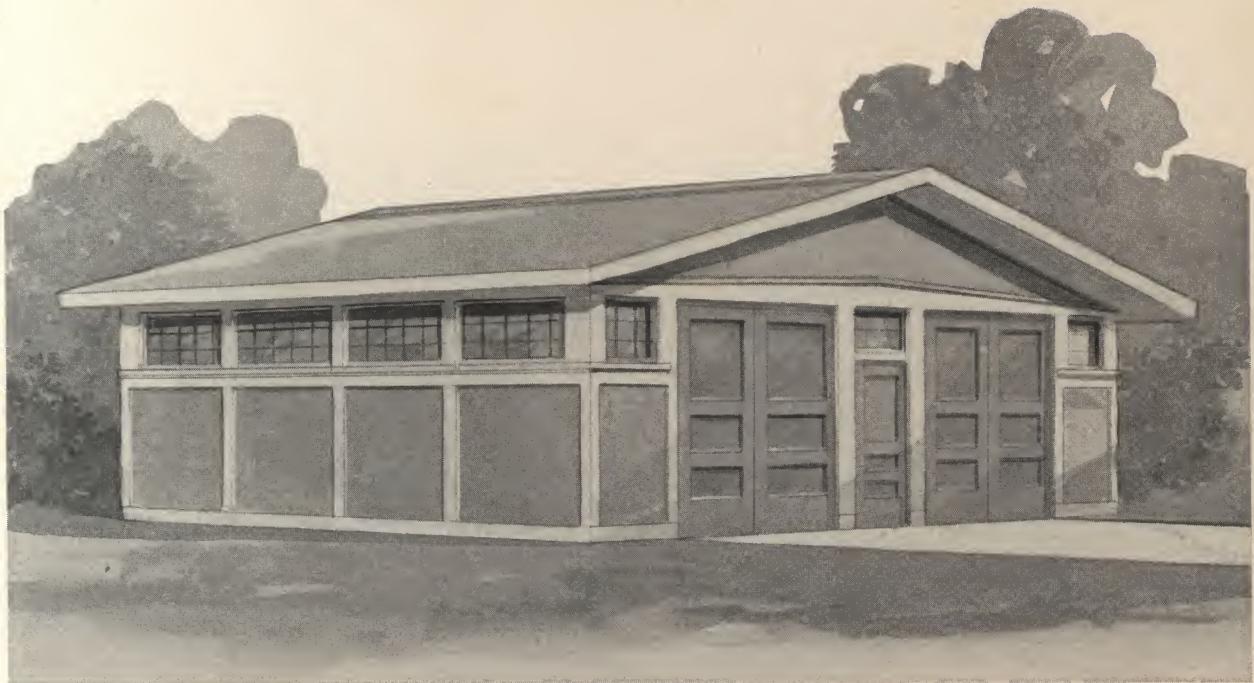
\$12.00

We mail plans and specifications the same day order is received.



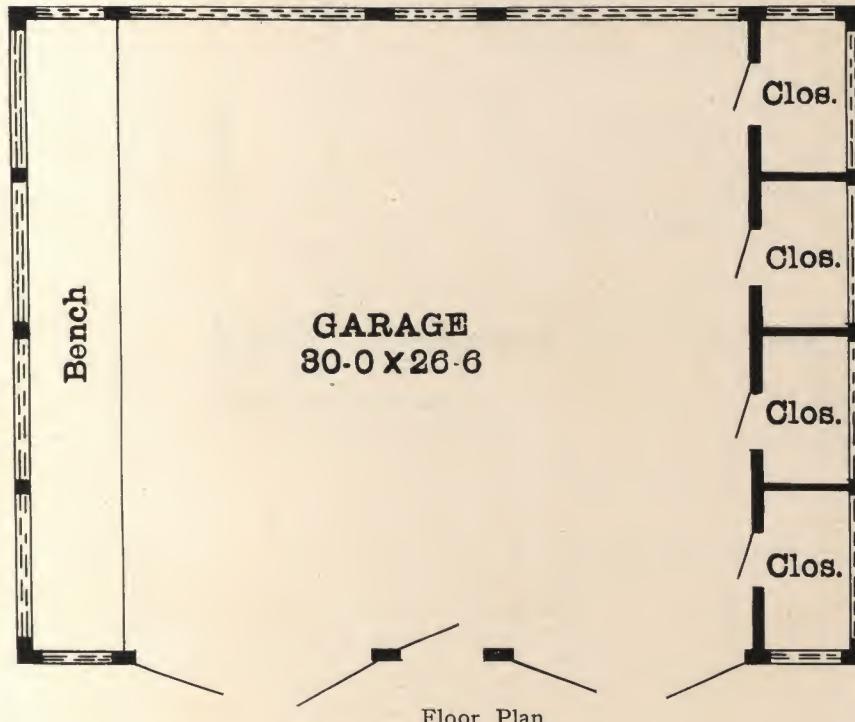
Floor Plan

Attractive design for small private garage of brick construction with stone trimmings. The garage proper is 22 feet square and will accommodate at least two machines. At the right is man's room with closets, bath, etc. Estimated cost of construction from about \$1,200.00 to about \$1,350.00.



Design No. G-140

SIZE: Width, 36 feet; Length, 28 feet.



Blue Prints consist of floor plan; front, rear, two side elevations; wall sections and all necessary details.

Specifications are typewritten and contain all the information necessary for the proper construction of the building.

PRICE

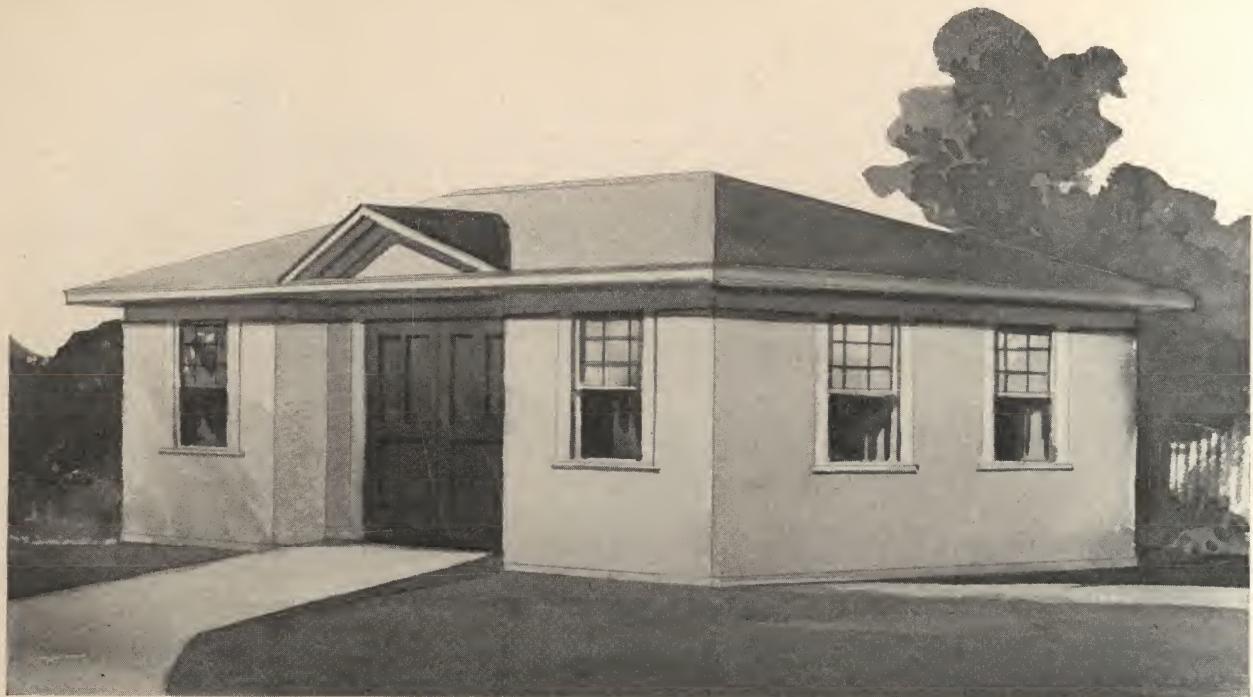
of Blue Prints, together with a complete set of typewritten specifications,

ONLY

\$8.00

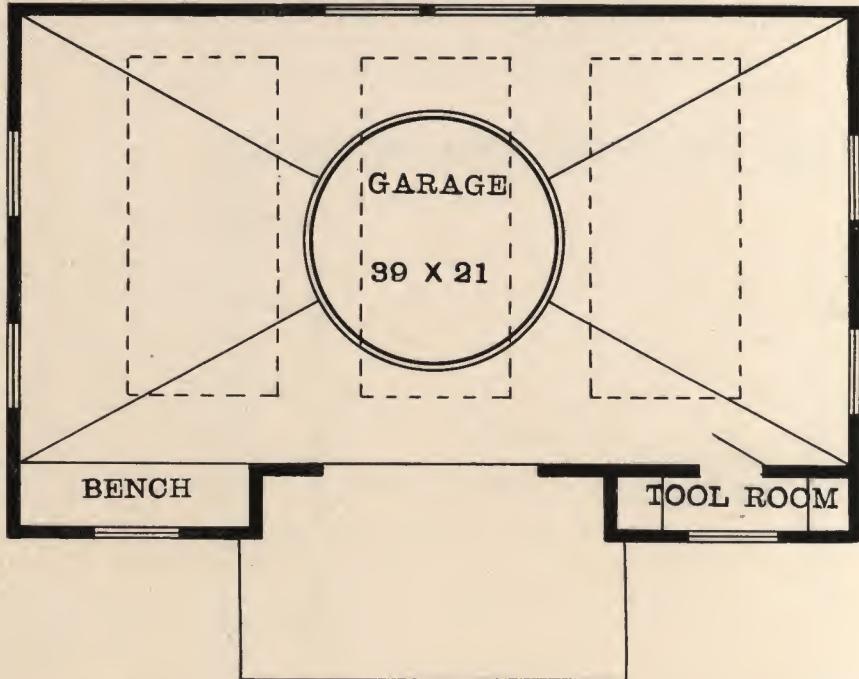
We mail plans and specifications the same day order is received.

Attractive design in stucco for private garage with accommodations for two machines. At one side is located the work bench and on the opposite sides are four closets to be used for storing supplies, tools, etc. Estimated cost of construction from about \$750.00 to about \$850.00.



Design No. G-108

Size: Width, 40 feet; Length, 25 feet



PRICE

of Blue Prints, together with a complete set of type-written specifications,

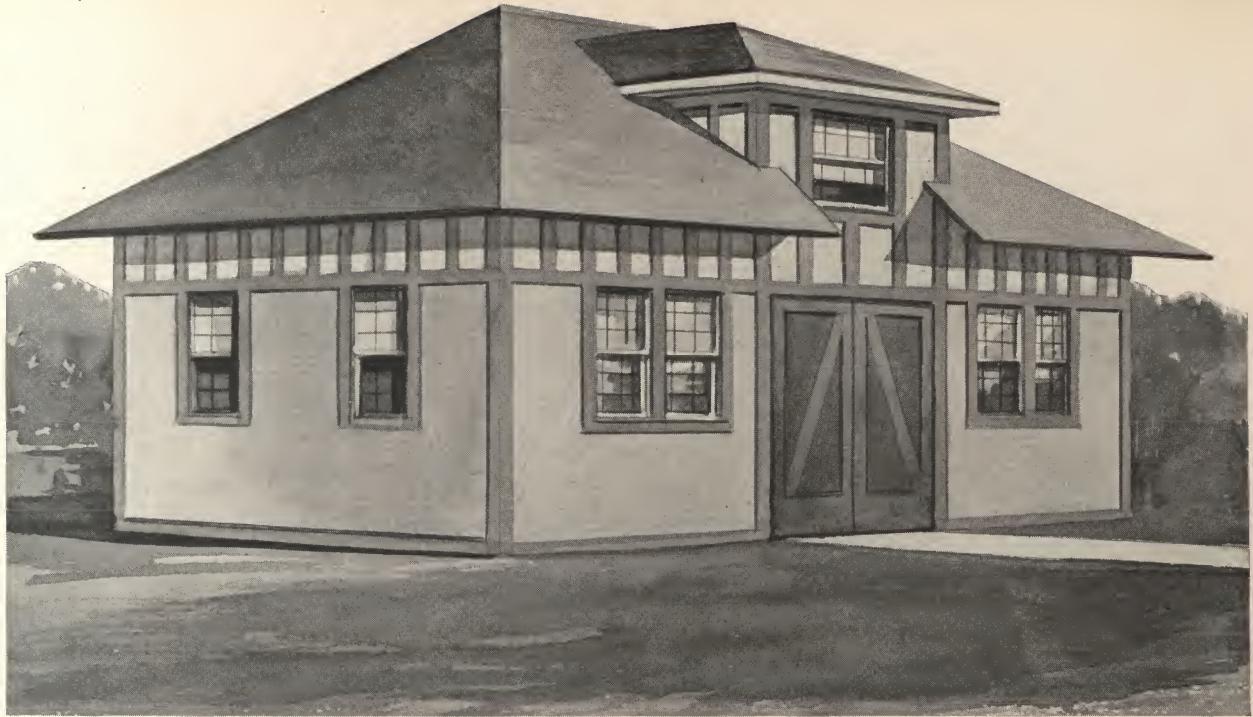
ONLY

\$8.00

We mail plans and specifications the same day order is received.

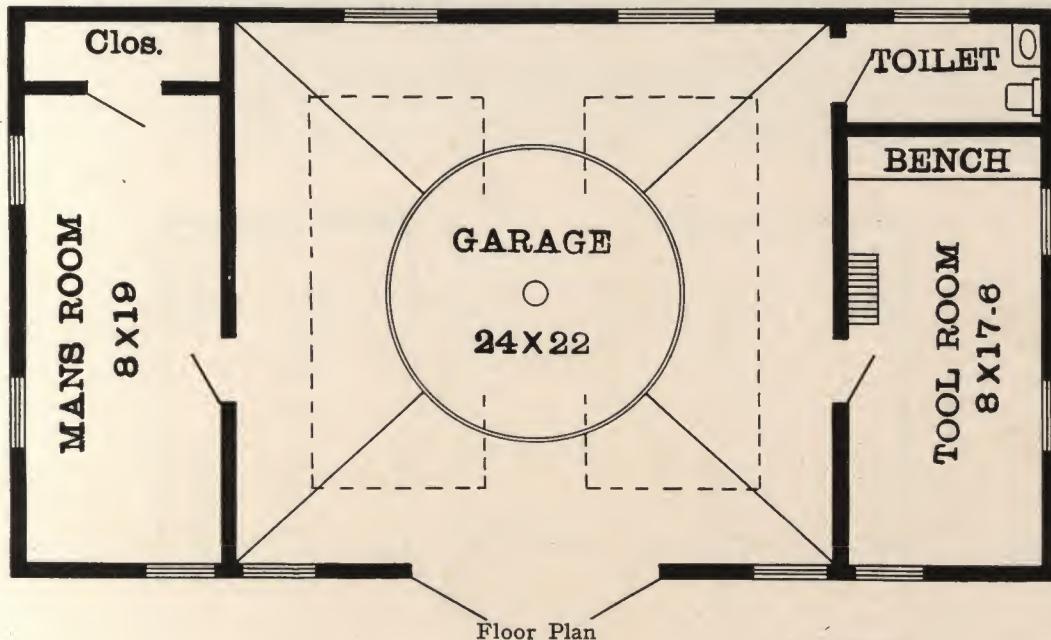
Neat design for private garage of frame covered with stucco. Will accommodate three machines. Large turntable in center. Bench and tool room located at either side of entrance. Estimated cost of construction from about \$900.00 to about \$1,000.00.

Blue Prints consist of floor plan; front, rear, two side elevations; wall sections and all necessary details. Specifications are typewritten and contain all the information necessary for the proper construction of the building.



Design No. G-118

Size: Width, 43 feet; Length, 23 feet



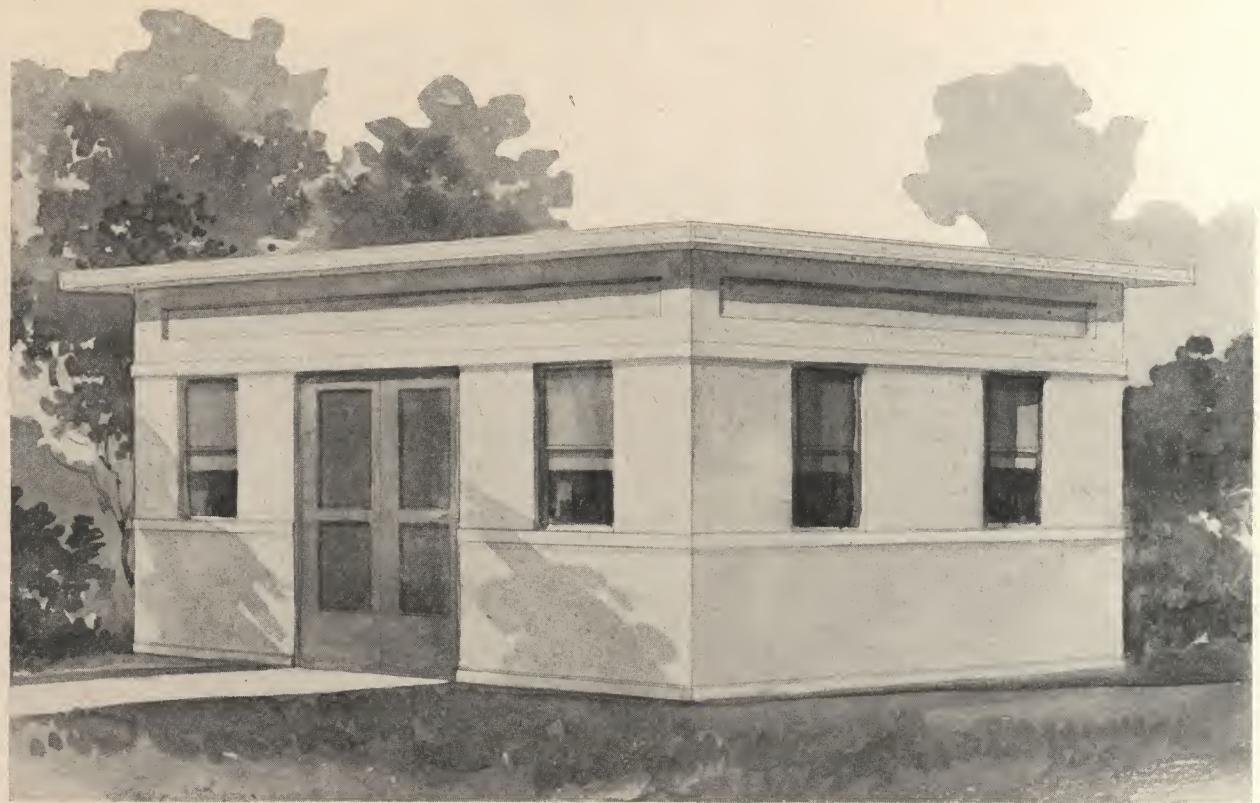
Blue Prints consist of floor plan; front, rear, two side elevations; wall sections and all necessary details. Specifications are typewritten, and contain all the information necessary for the proper construction of the building.

PRICE
of Blue Prints, together with a complete set of type-written specifications,

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\$8.00

We mail Plans and Specifications the same day order is received.

Attractive Old English design for Frame Garage, adaptable for city or suburbs. The garage proper is located in the center with sufficient room for two machines, and a large turntable with drain. At the left is located sleeping quarters for the chauffeur or care taker, and at the right the tool room and work bench. Estimated cost of construction from about \$1,000.00 to about \$1,100.00.



Design No. G-110

Size: Width, 38 feet; Length, 25 feet

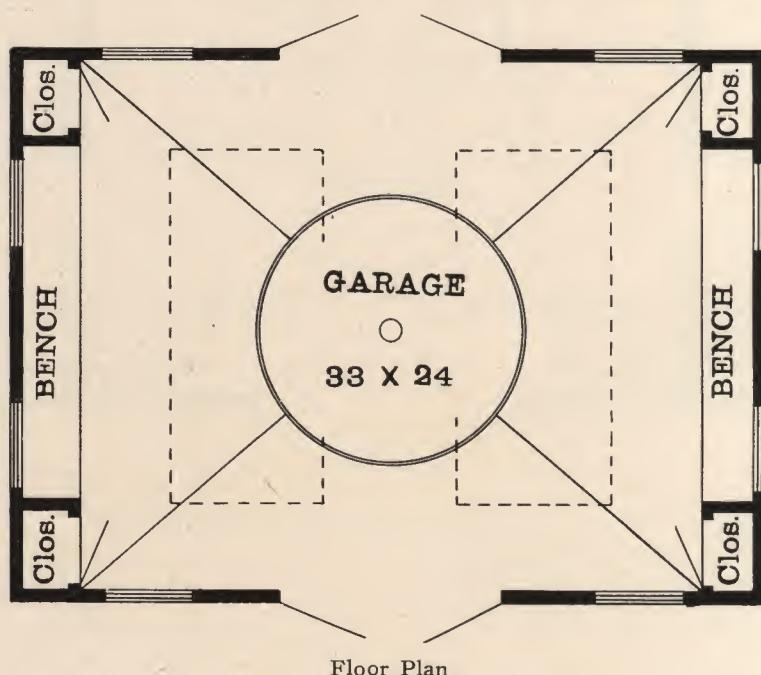
PRICE

of Blue Print, together with a complete set of typewritten specifications,

ONLY

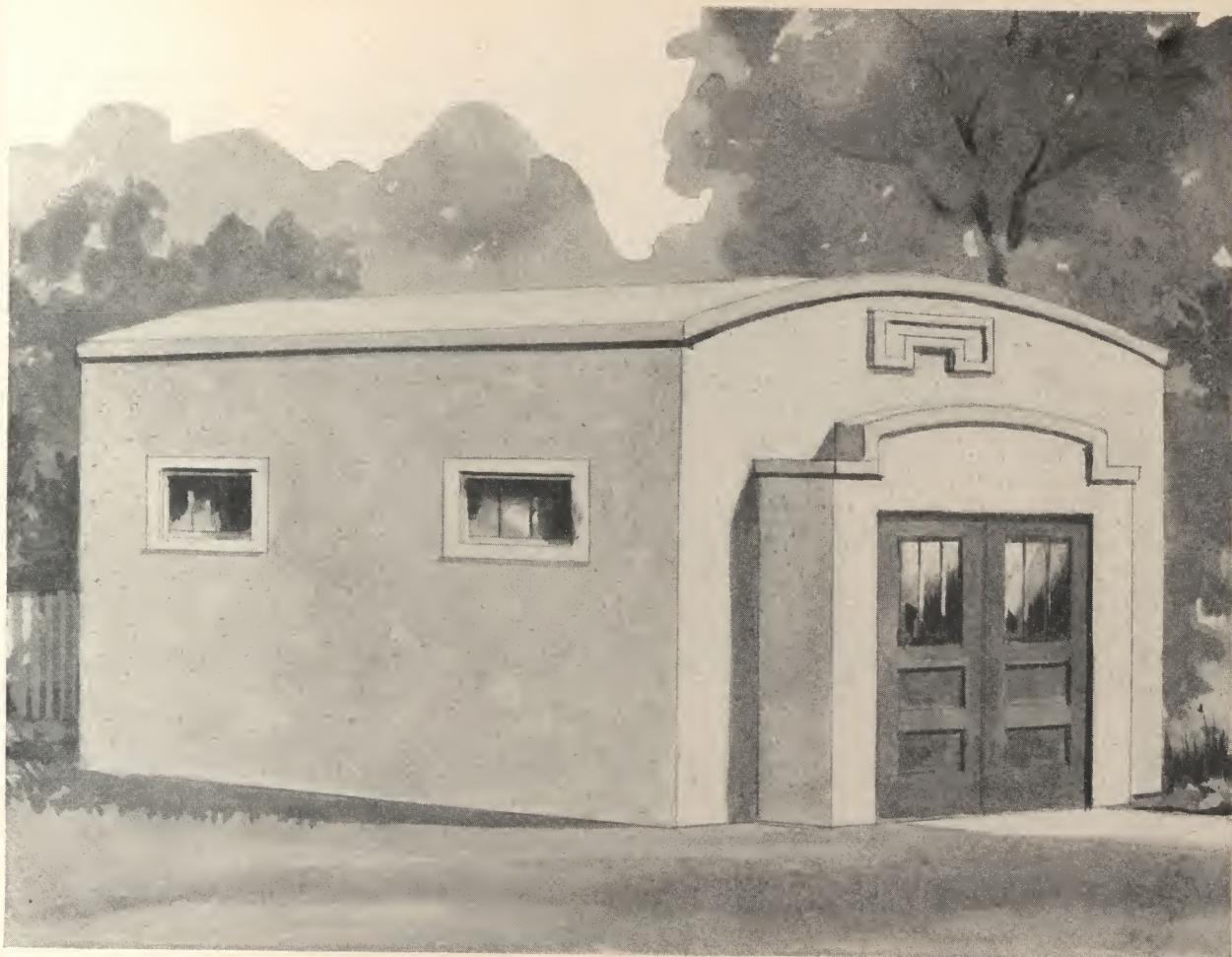
\$6.00

We mail Plans and Specifications the same day order is received.



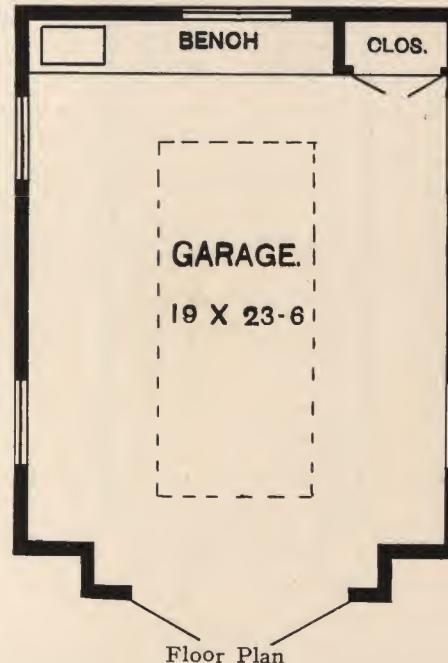
Blue Prints consist of floor plan; front, rear, two side elevations; wall sections and all necessary details. Specifications are typewritten and contain all the information necessary for the proper construction of the building.

Practical and inexpensive design for small private garage of stucco. There is sufficient room for two machines. Large turntable with drain in center. Work benches are located at either side with closets for storing supplies, tools, etc. Estimated cost of construction from about \$650.00 to about \$700.00.



Design No. G-109

Size: Width, 20 feet; Length, 27 feet



Blue Prints consist of floor plan; front, rear, two side elevations; wall sections and all necessary details. Specifications are typewritten and contain all the information necessary for the proper construction of the building.

PRICE

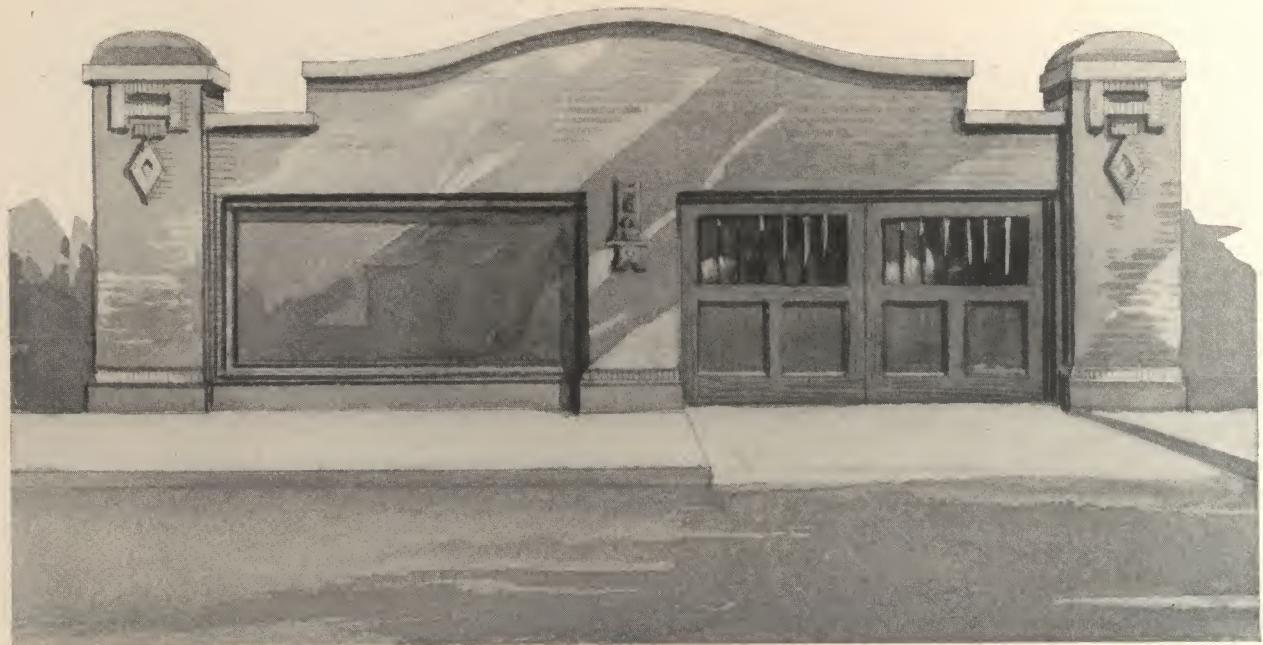
of Blue Prints, together with a complete set of typewritten specifications,

ONLY

\$5.00

We mail plans and specifications the same day order is received.

Private garage in Mission Style of stucco. Estimated cost of construction from about \$500.00 to about \$600.00.



Design No. G-132

SIZE: Width, 50 feet; Length, 125 feet.

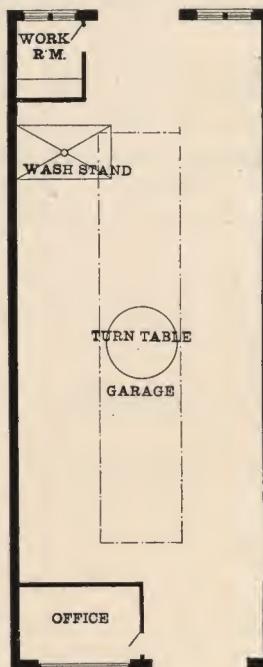
PRICE

of Blue Prints, together with a complete set of typewritten specifications,

ONLY

\$40.00

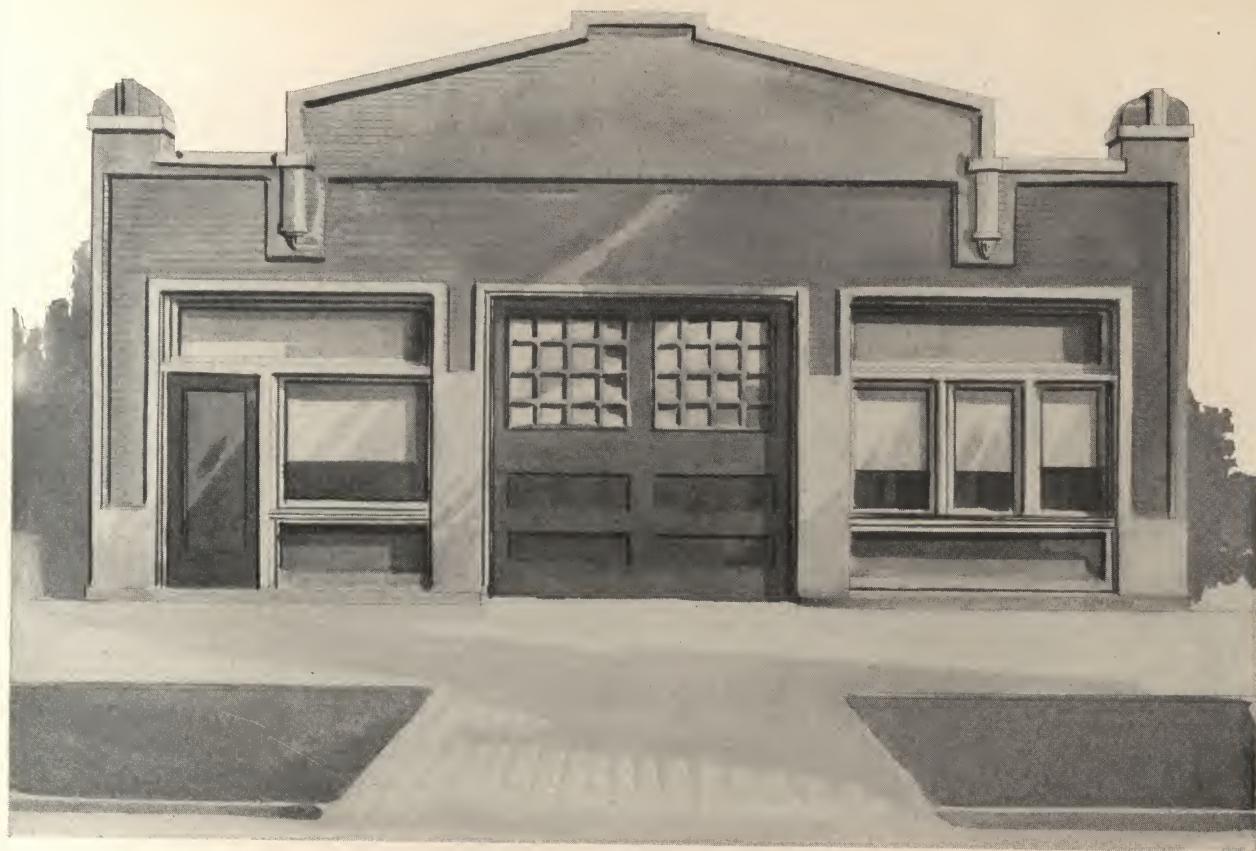
We mail plans and specifications the same day order is received.



Floor Plan

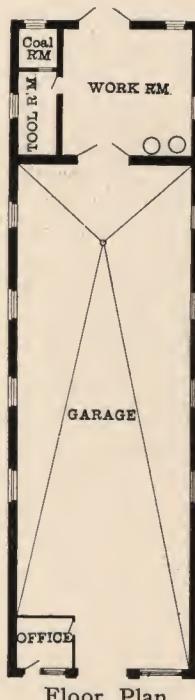
Blue Prints consist of floor plan; front, rear, two side elevations; wall sections and all necessary details. Specifications are typewritten and contain all the information necessary for the proper construction of the building.

Attractive design for large city garage of brick construction with cut stone trimmings. Turn-table in center and wash stand located at the rear, near work room. Estimated cost of construction from about \$4,500.00 to about \$4,750.00.



Design No. G-131

SIZE: Width, 36 feet; Length, 125 feet.



Floor Plan

Blue Prints consist of floor plan; front, rear, two side elevations; wall sections and all necessary details. Specifications are typewritten and contain all the information necessary for the proper construction of the building.

PRICE

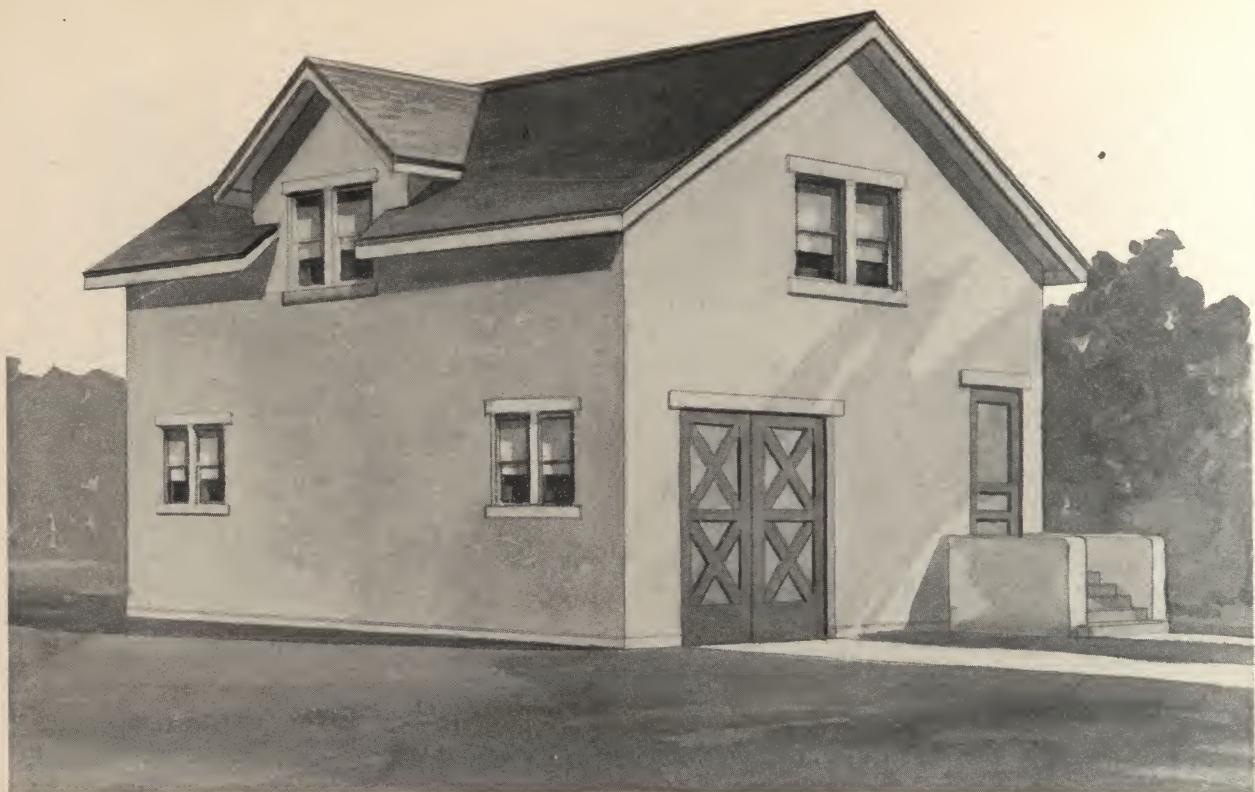
of Blue Prints, together with a complete set of typewritten specifications,

ONLY

\$35.00

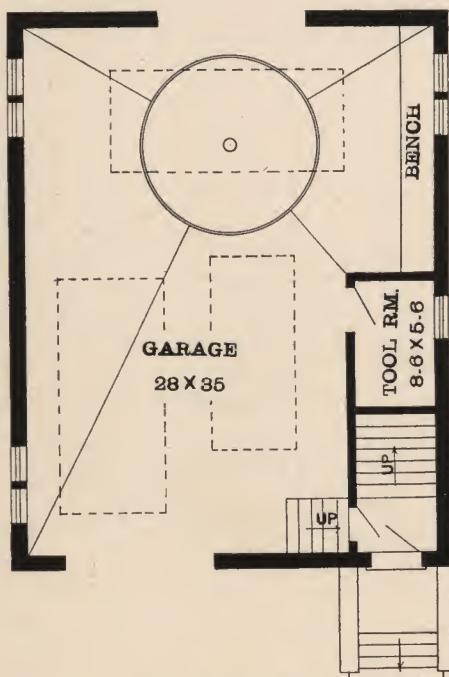
We mail plans and specifications the same day order is received.

Practical design for public garage for city. Material used is brick, with cut stone trimmings, which adds considerably to the appearance of the building. Estimated cost of construction from about \$3,800.00 to about \$4,000.00.



Design No. G-120

Size: Width, 30 feet; Length, 38 feet

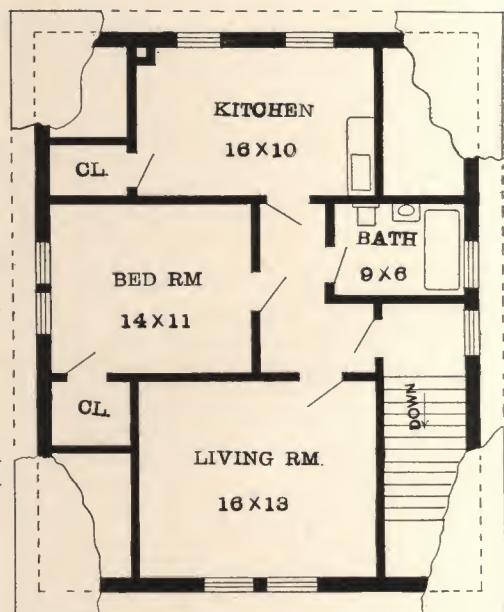


First Floor Plan

PRICE
of Blue Prints, together
with a complete set of
typewritten specifications,

ONLY
\$15.00

We mail plans and spe-
cifications the same day
order is received.



Second Floor Plan

Blue Prints consist of first and second floor plans; front, rear, two side elevations; wall sections and all necessary details. Specifications are typewritten and contain all the information necessary for the proper construction of the building.

Neat and practical design for small private garage of brick construction, with living quarters above. The first floor is arranged so that it can accommodate three machines and is equipped with turntable with center drain. The second floor contains living room, kitchen, bed room, bath, closets, etc. The estimated cost of construction is from about \$2,200.00 to about \$2,500.00.



Design No. G-105

Size: Width, 36 feet; Length, 46 feet

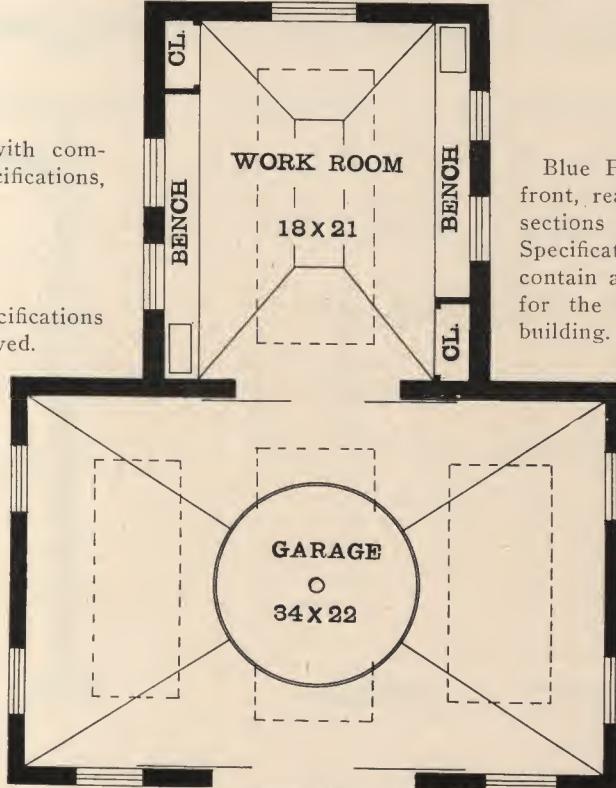
PRICE

of Blue Prints, together with complete set of typewritten specifications,

ONLY

\$10.00

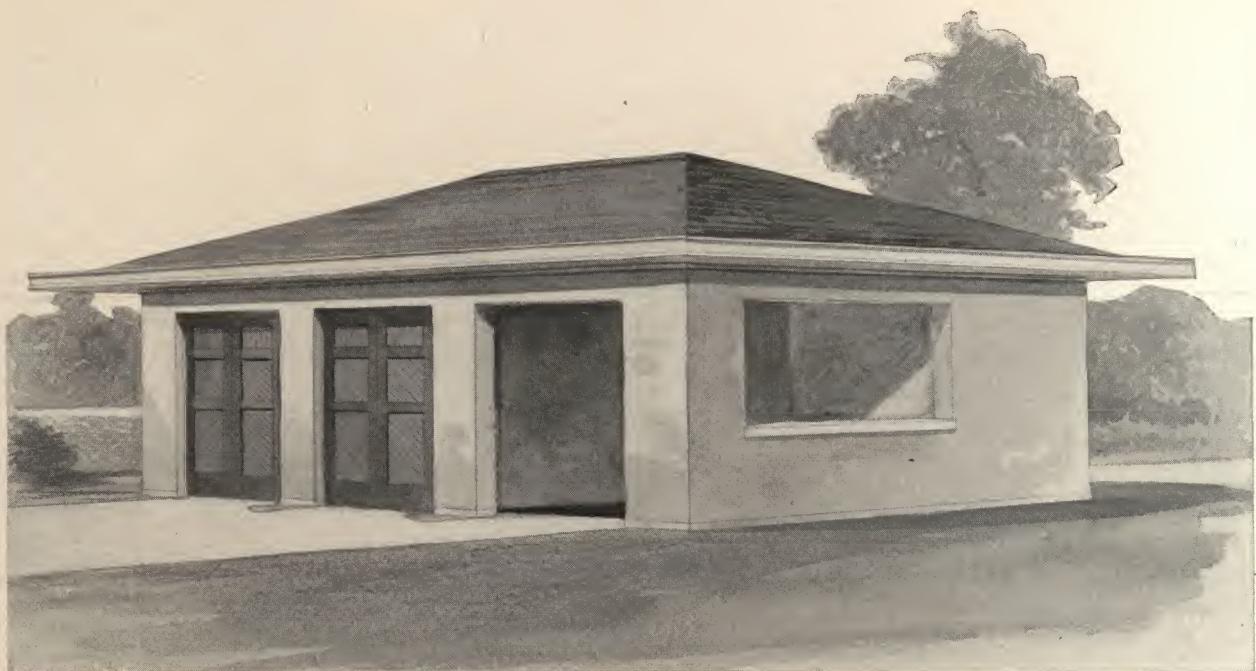
We mail plans and specifications the same day order is received.



Floor Plan

Mission Design for garage of concrete construction, with accommodation for three machines in front portion of the building. Large turntable with drain located right in the center. In the rear there is a large workroom with benches and closets at either side. Estimated cost of construction from about \$1,800 to about \$2,000.00.

Blue Prints consist of floor plans; front, rear, two side elevations; wall sections and all necessary details. Specifications are typewritten and contain all the information necessary for the proper construction of the building.



Design No. G-117

SIZE: Width, 44 feet; Length, 29 feet.

Blue Prints consist of floor plans; front, rear, two side elevations; wall sections and all necessary details. Specifications are typewritten and contain all the information necessary for the proper construction of the building.

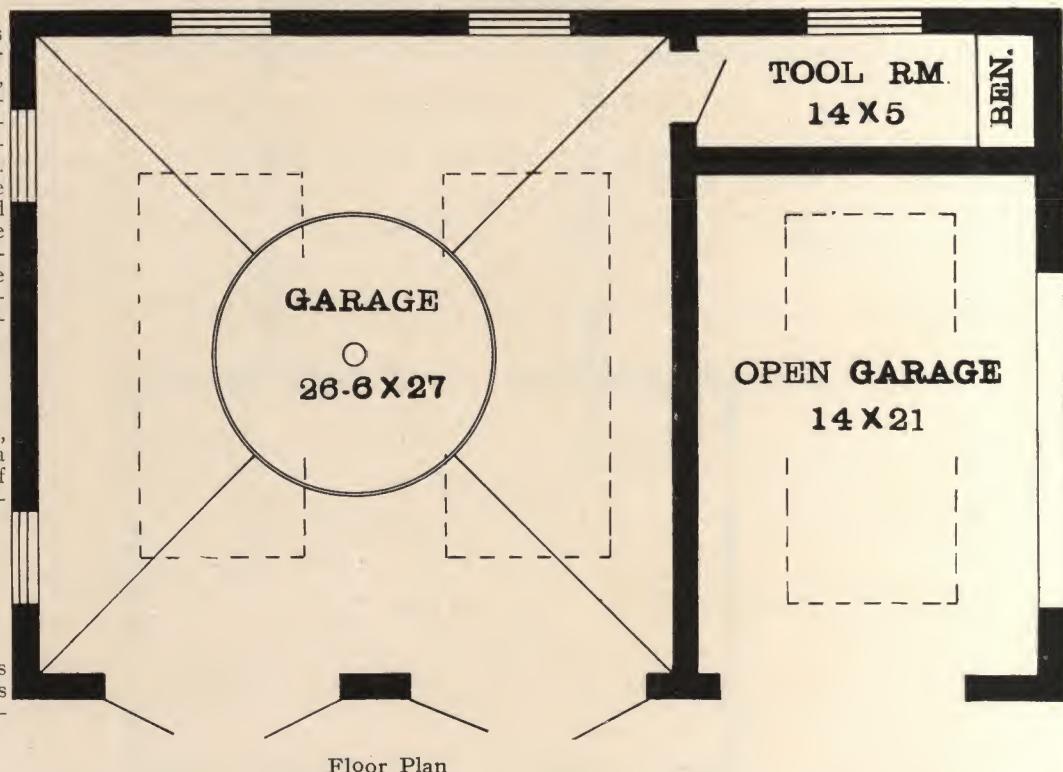
PRICE

of Blue Prints, together with a complete set of typewritten specifications,

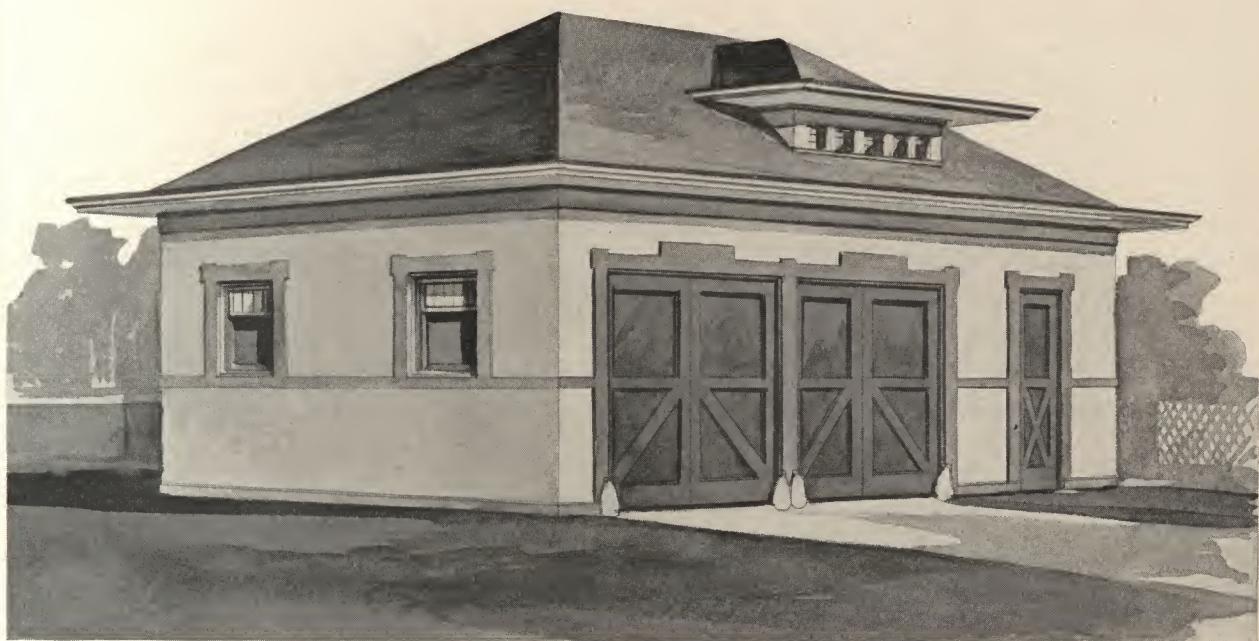
ONLY

\$8.00

We mail plans and specifications the same day order is received.

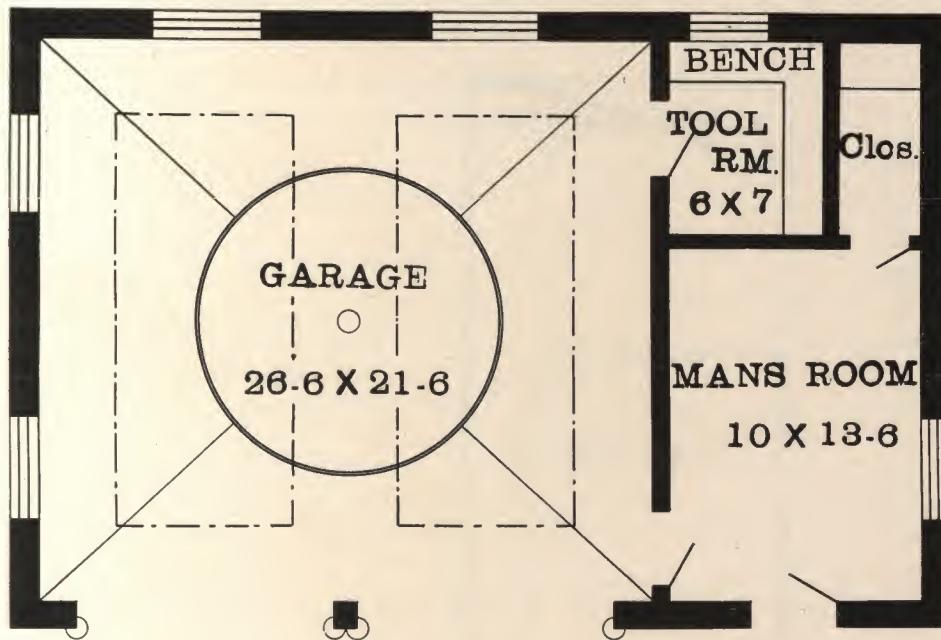


Unique design for private garage of brick construction. The garage proper will accommodate two machines, and has a large turntable with drain in center. The open garage at the right is intended for temporary use to protect machine from the elements, or can be used for guests' machine. Back of the open garage is located the tool room and work bench. Estimated cost of construction from about \$1,250.00 to about \$1,350.00.



Design No. G-116

SIZE: Width, 36 feet; Length, 24 feet.



Floor Plan

Blue Prints consist of floor plan; front, rear, two side elevations; wall sections and all necessary details. Specifications are typewritten and contain all the information necessary for the proper construction of the building.

PRICE

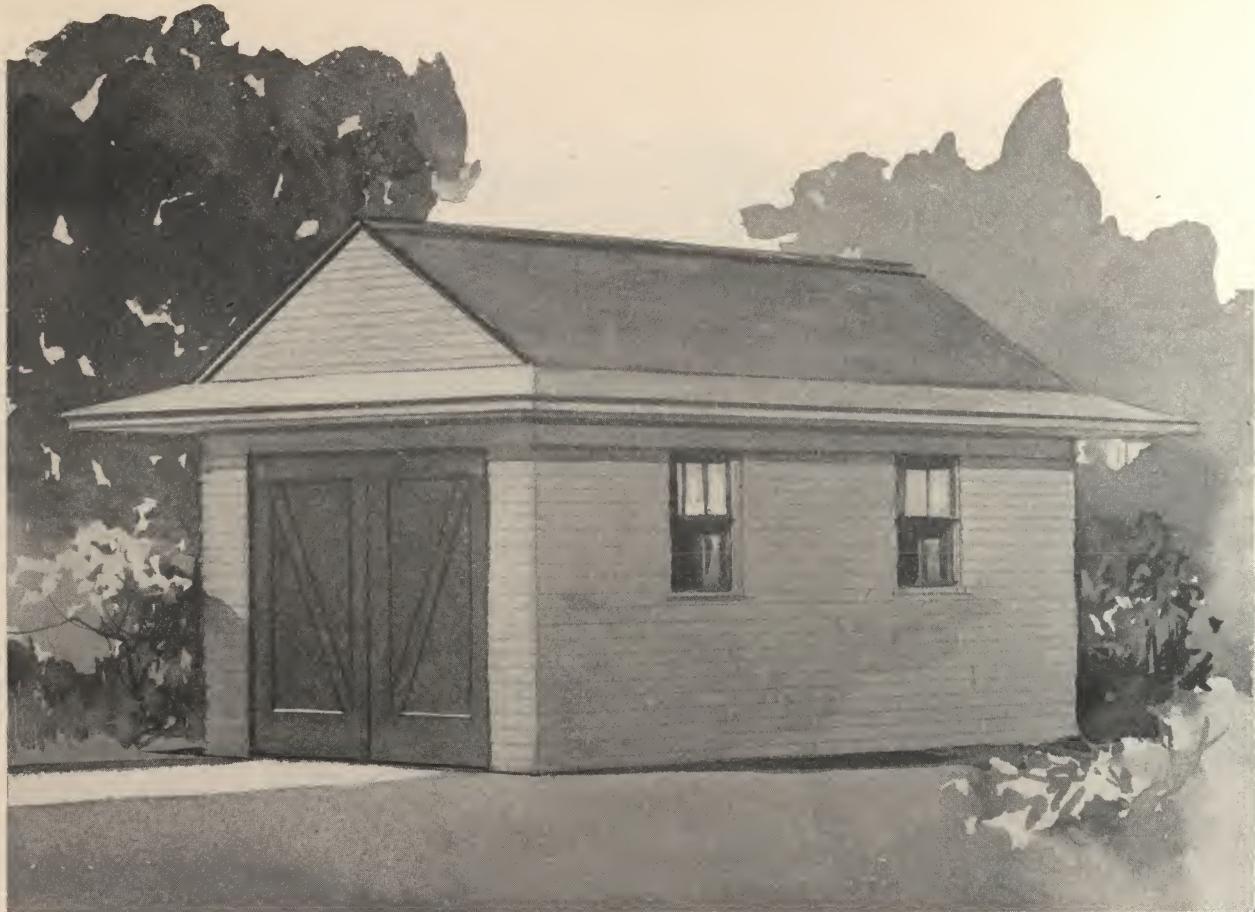
of Blue Prints, together with complete set of typewritten specifications,

ONLY

\$10.00

We mail plans and specifications the same day order is received.

Neat design for private garage of brick construction. Will accommodate two machines and has a large turn-table with drain in center. At the right is sleeping room for chauffeur or care taker. Also a fair sized room for the storing of tools, supplies, etc. Estimated cost of construction from about \$800.00 to about \$900.00.



Design No. G-125

SIZE: Width, 14 feet; Length, 25 feet.

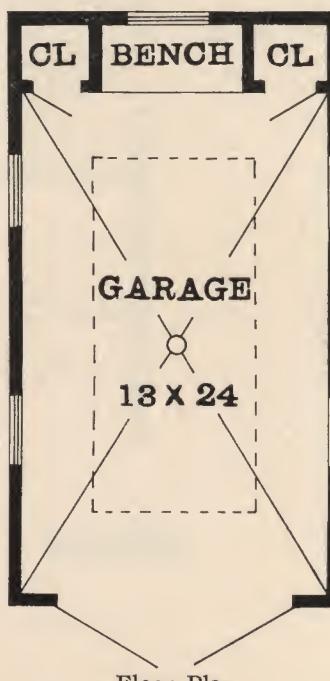
PRICE

of Blue Prints, together with a complete set of typewritten specifications,

ONLY

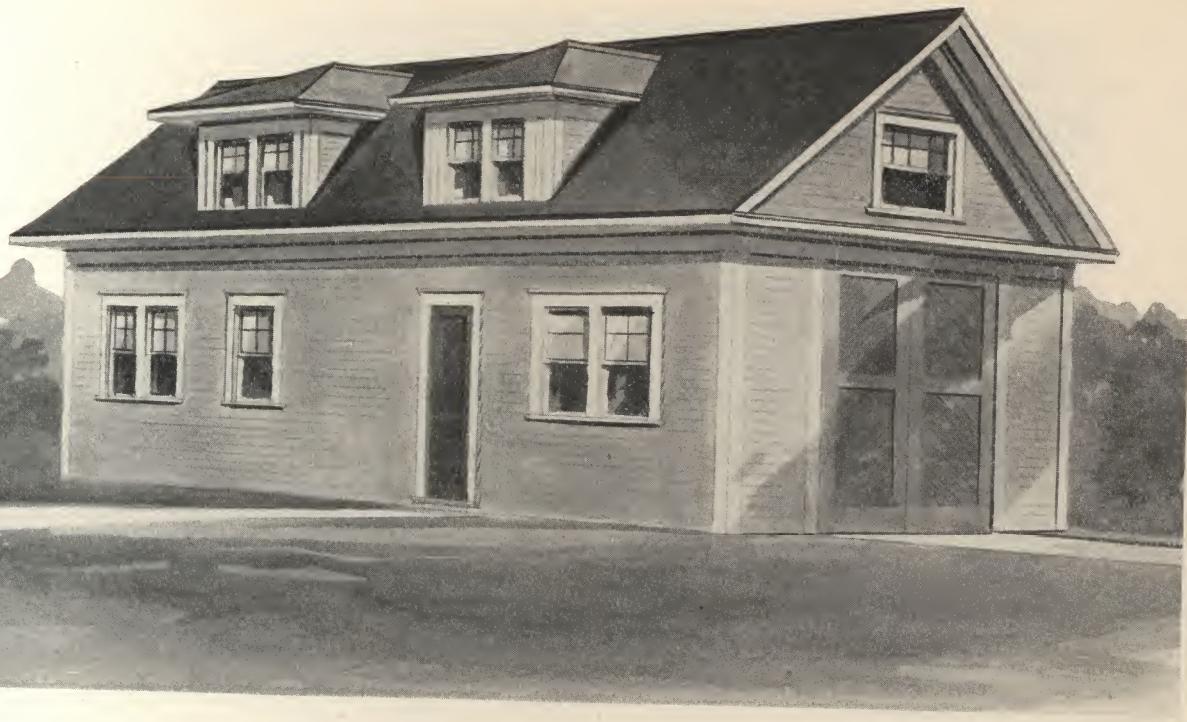
\$5.00

We mail plans and specifications the same day order is received.



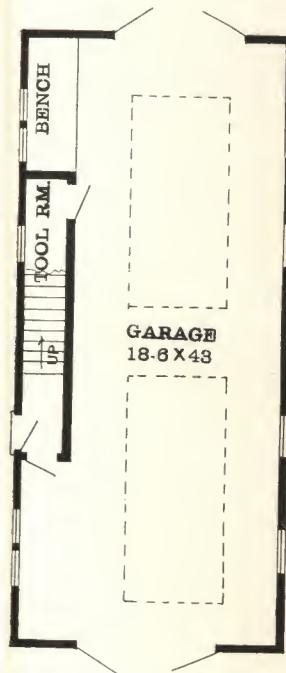
Blue Prints consist of floor plan; front, rear, two side elevations; wall sections and all necessary details. Specifications are typewritten and contain all the information necessary for the proper construction of the building.

Inexpensive frame garage, suitable for city or suburbs. Estimated cost of construction from about \$400.00 to about \$450.00.



Design No. G-113

SIZE: Width, 20 feet; Length, 24 feet.



First Floor Plan

Blue Prints consist of first and second floor plans; front, rear, two side elevations; wall sections and all necessary details. Specifications are typewritten and contain all the information necessary for the proper construction of the building.

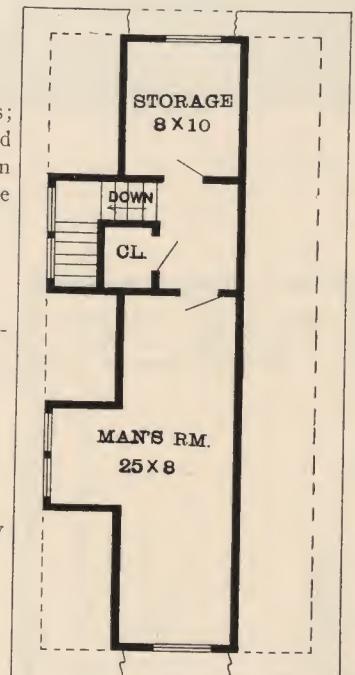
PRICE

of Blue Prints, together with a complete set of typewritten specifications,

ONLY

\$8.00

We mail plans and specifications the same day order is received.



Second Floor Plan

Design for small frame garage, with accommodations for two machines on lower floor. In the attic there is one large room for man 25 ft. long by 8 ft. wide, and a storage room 8 ft. by 10 ft. Estimated cost of construction from about \$850.00 to about \$950.00.



Design No. G-114

SIZE: Width, 30 feet; Length, 45 feet.

Blue Prints consist of first and second floor plans; front, rear, two side elevations; wall sections and all necessary details. Specifications are typewritten and contain all the information necessary for the proper construction of the building.

PRICE

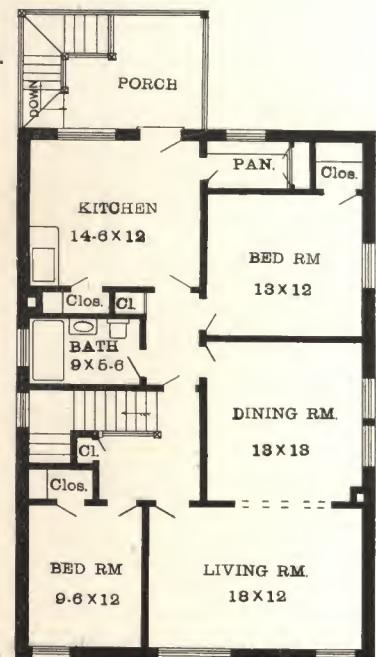
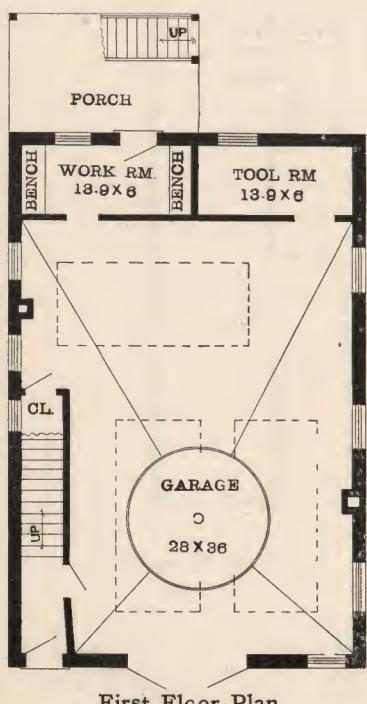
of Blue Prints, together with a complete set of typewritten specifications,

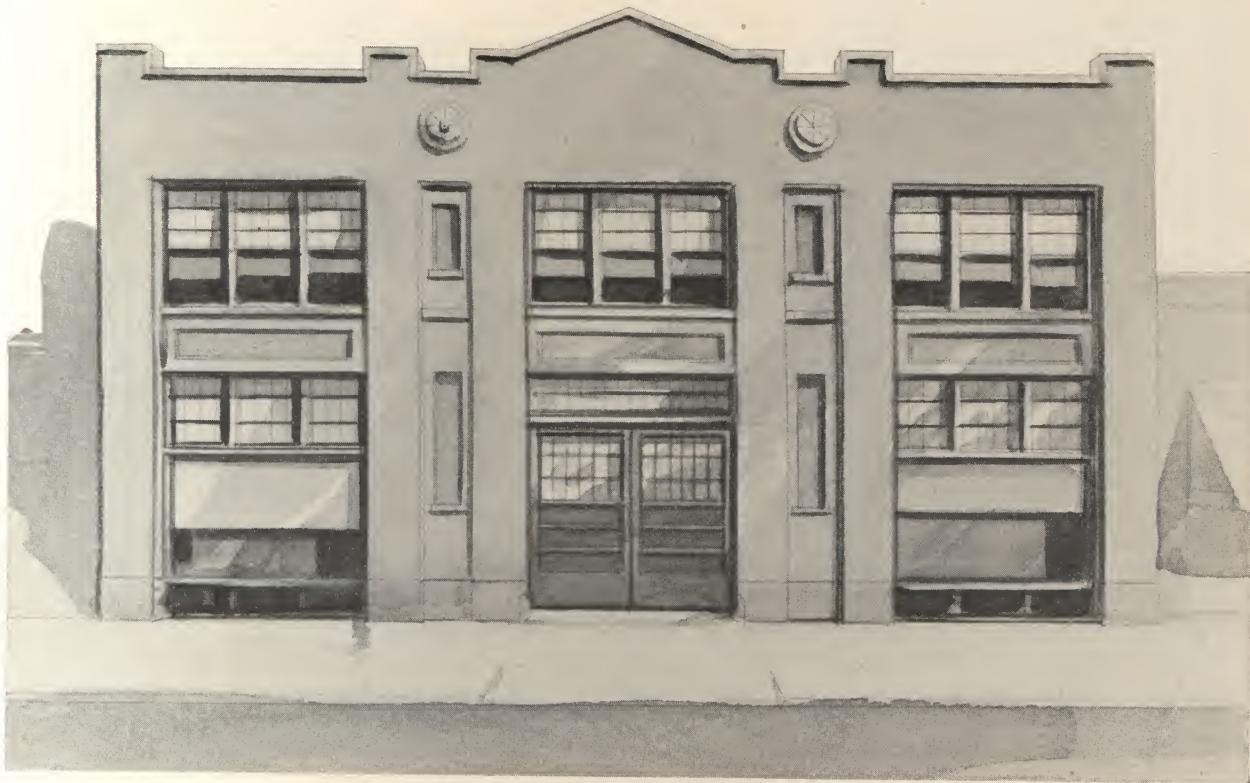
ONLY

\$15.00

We mail plans and specifications the same day order is received.

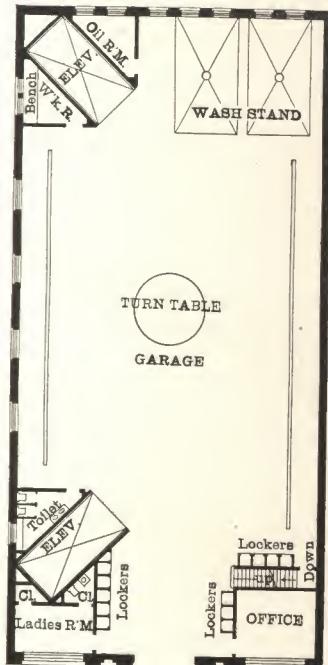
Pleasing design for private garage of brick construction, suitable for city. The lower floor will accommodate three machines in addition to having work room and tool room. It is also equipped with turntable. The second floor is arranged for living quarters, having three living rooms, two chambers, bath, closets, etc. Estimated cost of construction from about \$2,800.00 to about \$3,000.00.





Design No. G-129

SIZE: Width, 60 feet; Length, 125 feet.



First Floor Plan

Blue Prints consist of first and second floor plans; front, rear, two side elevations; wall sections and all necessary details. Specifications are typewritten and contain all the information necessary for the proper construction of the building.

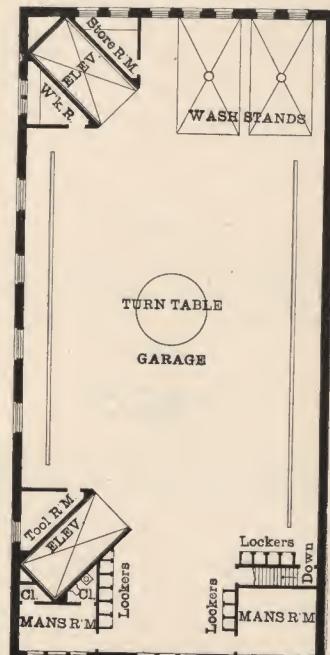
PRICE

of Blue Prints, together with a complete set of typewritten specifications,

ONLY

\$50.00

We mail plans and specifications the same day order is received.



Second Floor Plan

Modern design in brick for two-story public garage for large city. Both floors being used for the storage of machines. The turntables are conveniently located in the center and the wash stands in the rear on each floor. Provision has been made for two elevators, one in the front and the other in the rear of the building. Estimated cost of construction is from about \$9,500.00 to about \$11,000.00.



Design No. G-127

SIZE: Width, 14 feet; Length, 24 feet.

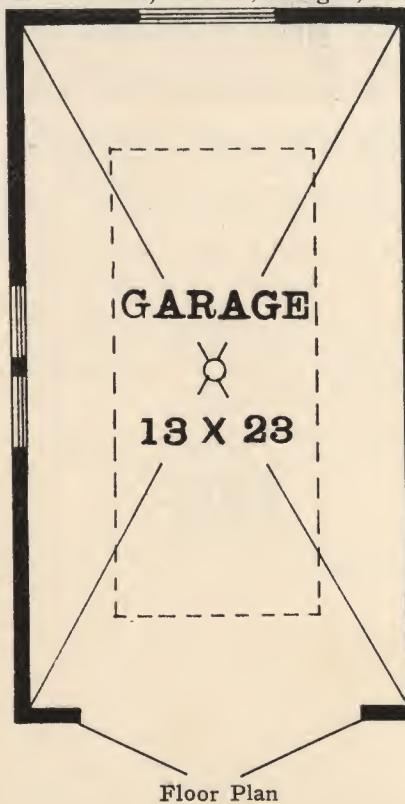
PRICE

of Blue Prints, together with a complete set of typewritten specifications,

ONLY

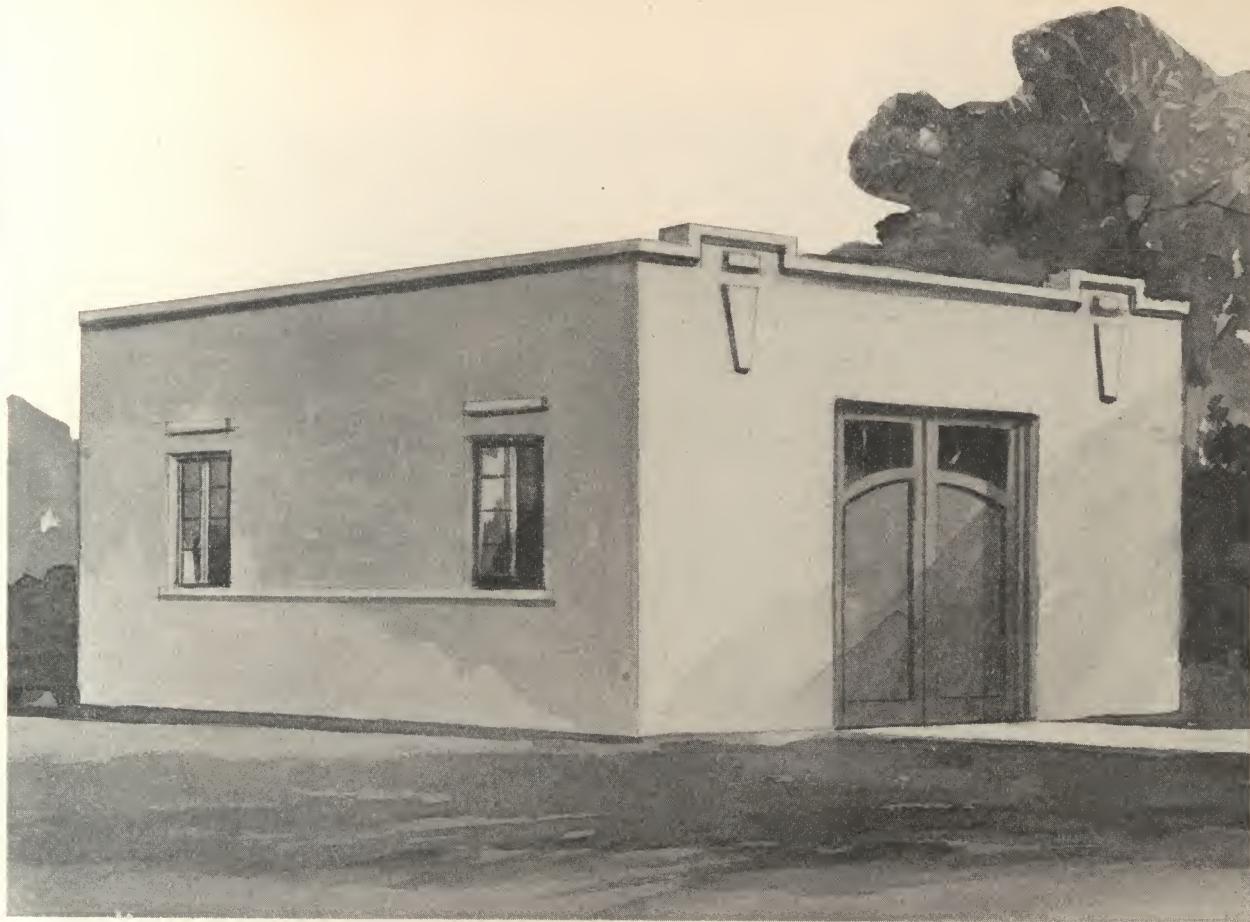
\$5.00

We mail plans and specifications the same day order is received.



Blue Prints consist of floor plan; front, rear, two side elevations; wall sections and all necessary details. Specifications are typewritten and contain all the information necessary for the proper construction of the building.

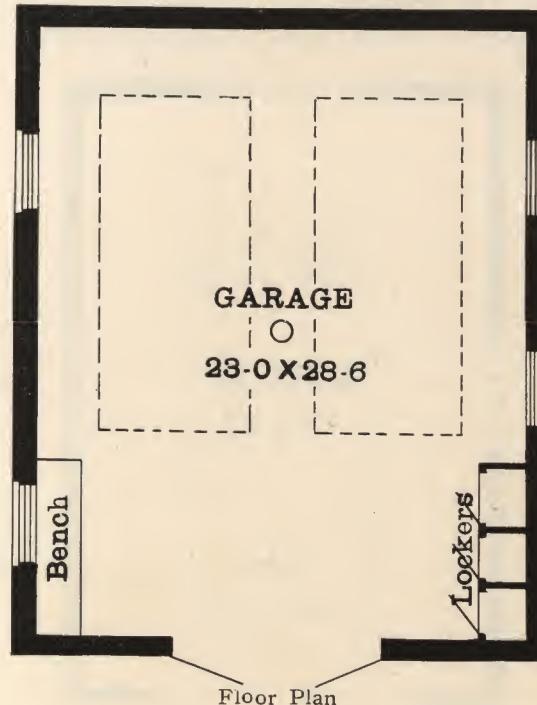
Combination frame and plaster design, for small private garage. Estimated cost of construction from about \$450.00 to about \$500.00.



Design No. G-104

SIZE: Width, 25 feet; Length, 30 feet.

Blue Prints consist of floor plan; front, rear, two side elevations; wall sections and all necessary details. Specifications are typewritten and contain all the information necessary for the proper construction of the building.



PRICE

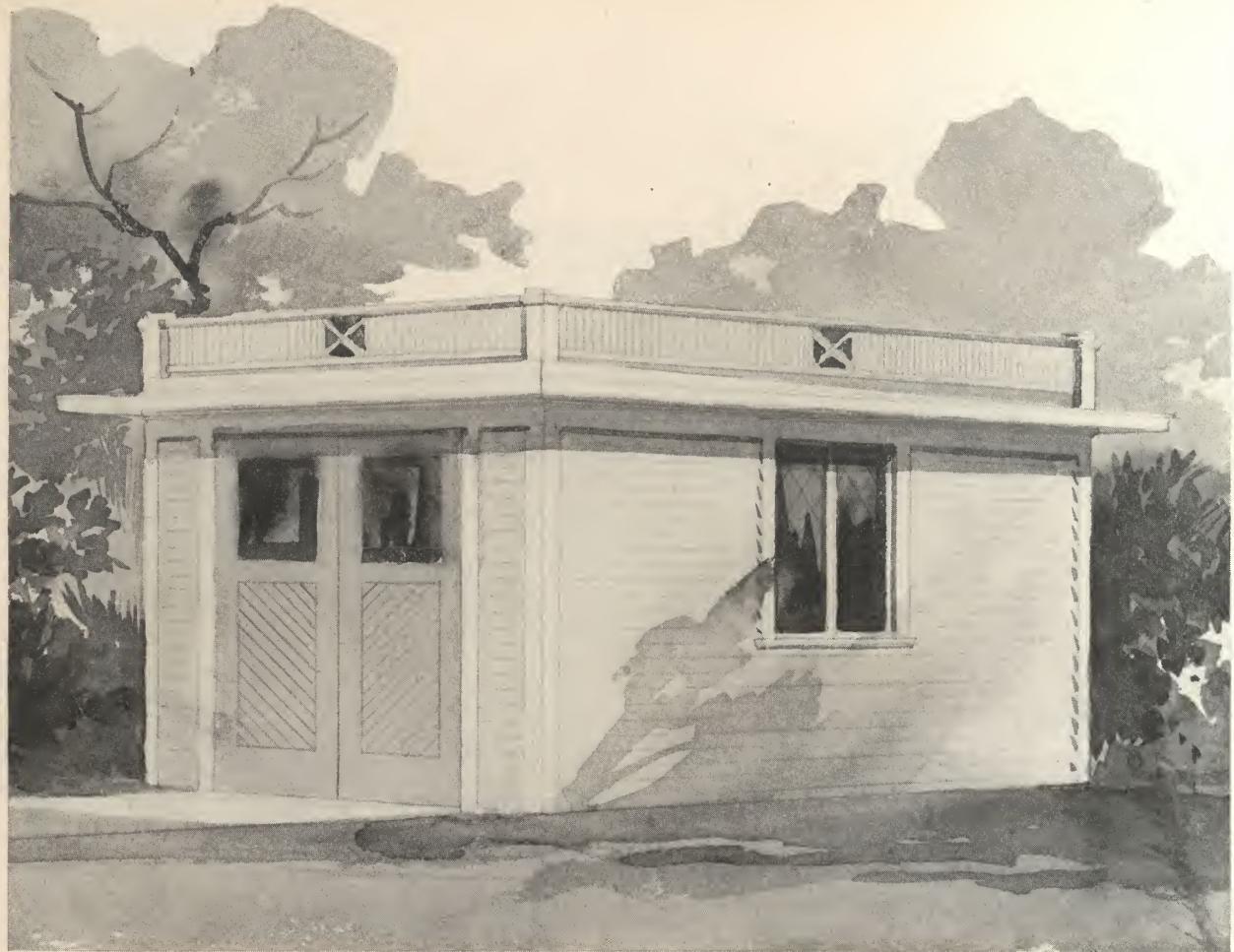
of Blue Prints, together with a complete set of typewritten specifications,

ONLY

\$6.00

We mail plans and specifications the same day order is received.

Concrete garage in Mission style, with accommodations for two machines. Estimated cost of construction from about \$700.00 to \$800.00.



Design No. G-124

SIZE: Width, 16 feet; Length, 23 feet.

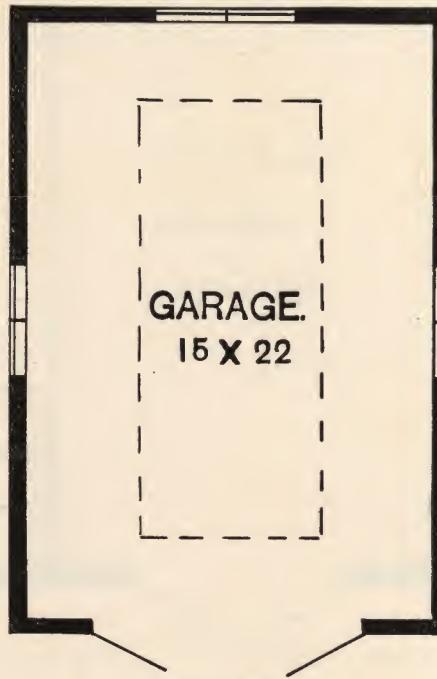
PRICE

of Blue Prints, together with a complete set of typewritten specifications,

ONLY

\$5.00

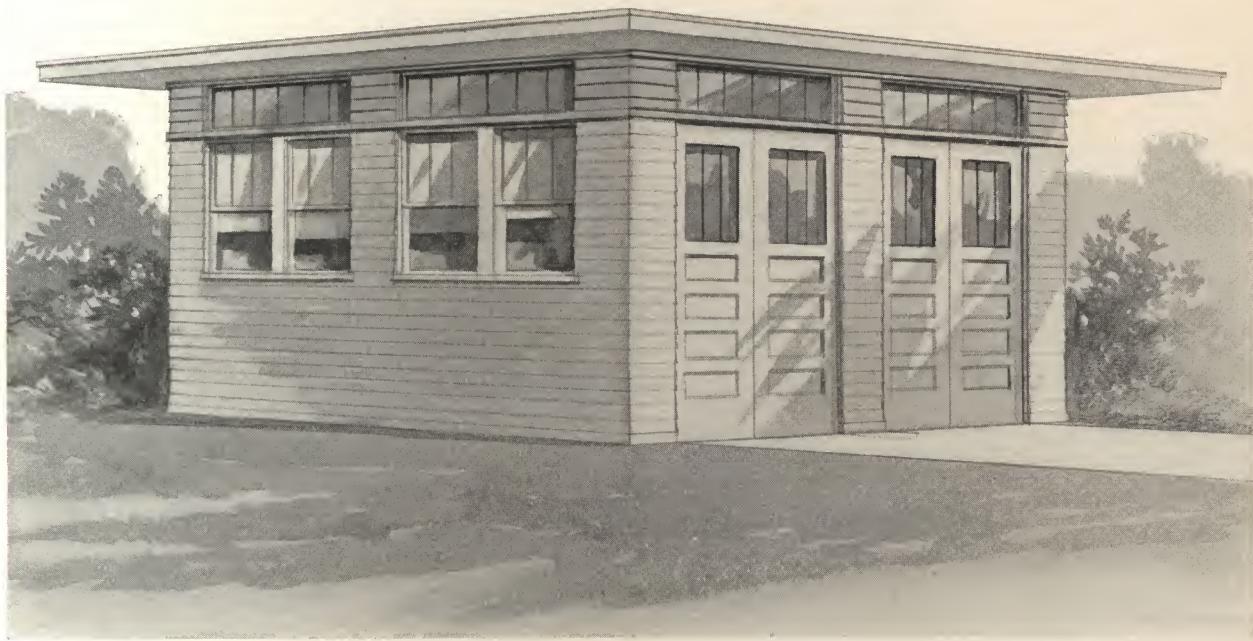
We mail plans and specifications the same day order is received.



Floor Plan

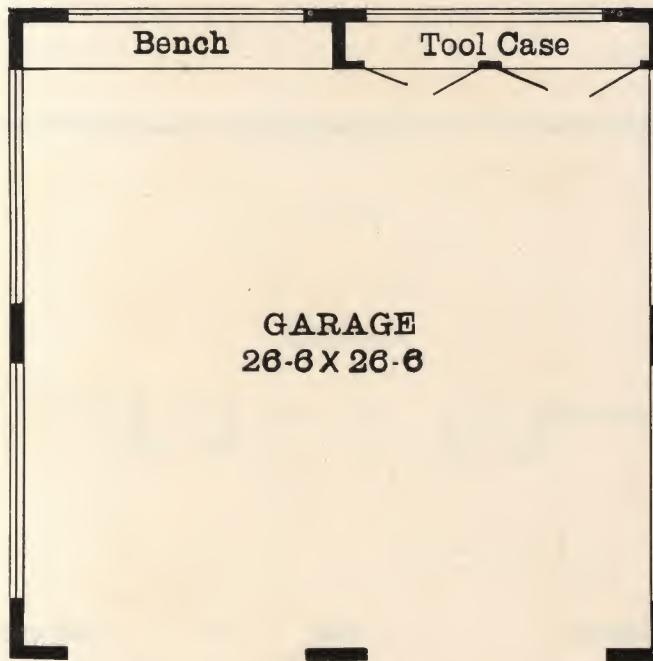
Blue Prints consist of floor plan; front, rear, two side elevations; wall sections and all necessary details. Specifications are typewritten and contain all the information necessary for the proper construction of the building.

Small private frame garage of Colonial style. Estimated cost of construction from about \$375.00 to about \$450.00.



Design No. G-137

SIZE: Width, 27 feet, 6 inches; Length, 27 feet, 6 inches.



Floor Plan

Blue Prints consist of floor plan; front, rear, two side elevations; wall sections and all necessary interior details.

Specifications are typewritten and contain all the information necessary for the proper construction of the building.

PRICE

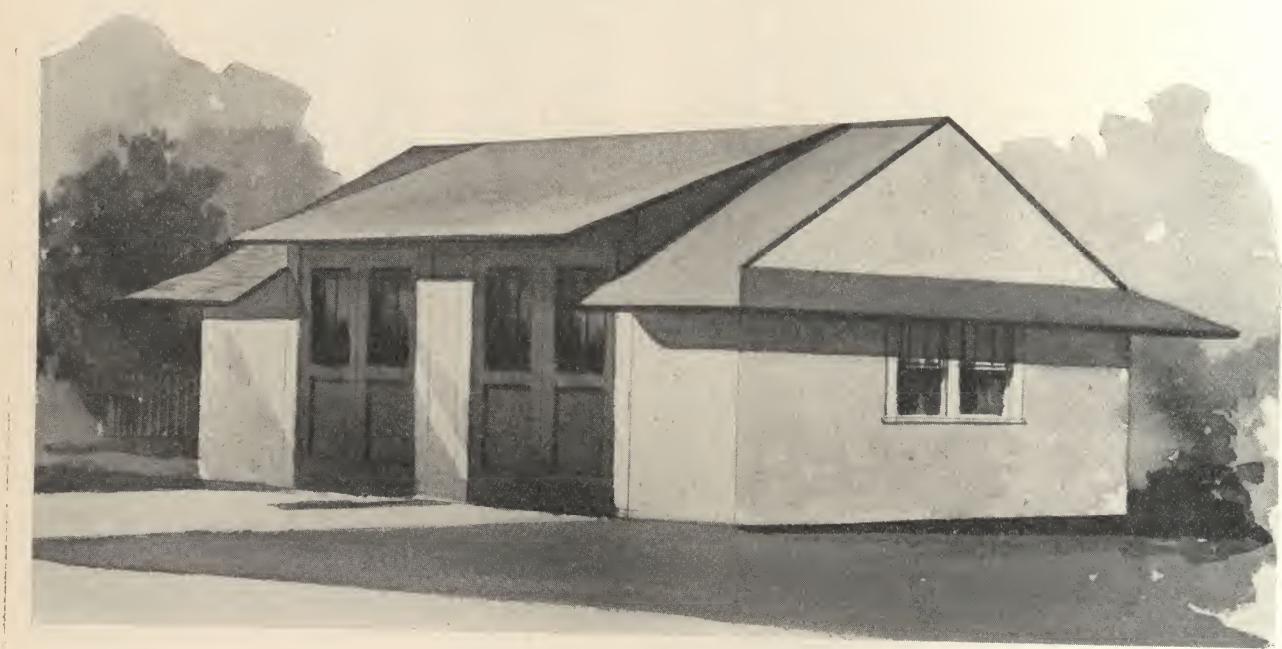
of Blue Prints, together with a complete set of typewritten specifications,

ONLY

\$6.00

We mail plans and specifications the same day order is received.

Artistic design for a frame garage for private use. Large double doors in front with glass panels and windows on all sides. In the rear are located the work bench and tool case. Estimated cost of construction from about \$550.00 to about \$675.00.



Design No. G-123

SIZE: Width, 35 feet; Length, 23 feet.

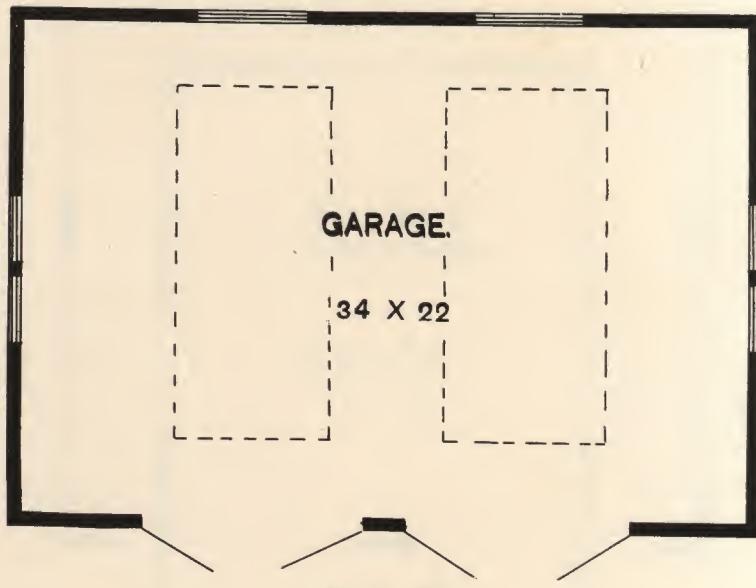
PRICE

of Blue Prints, together with a complete set of type-written specifications,

ONLY

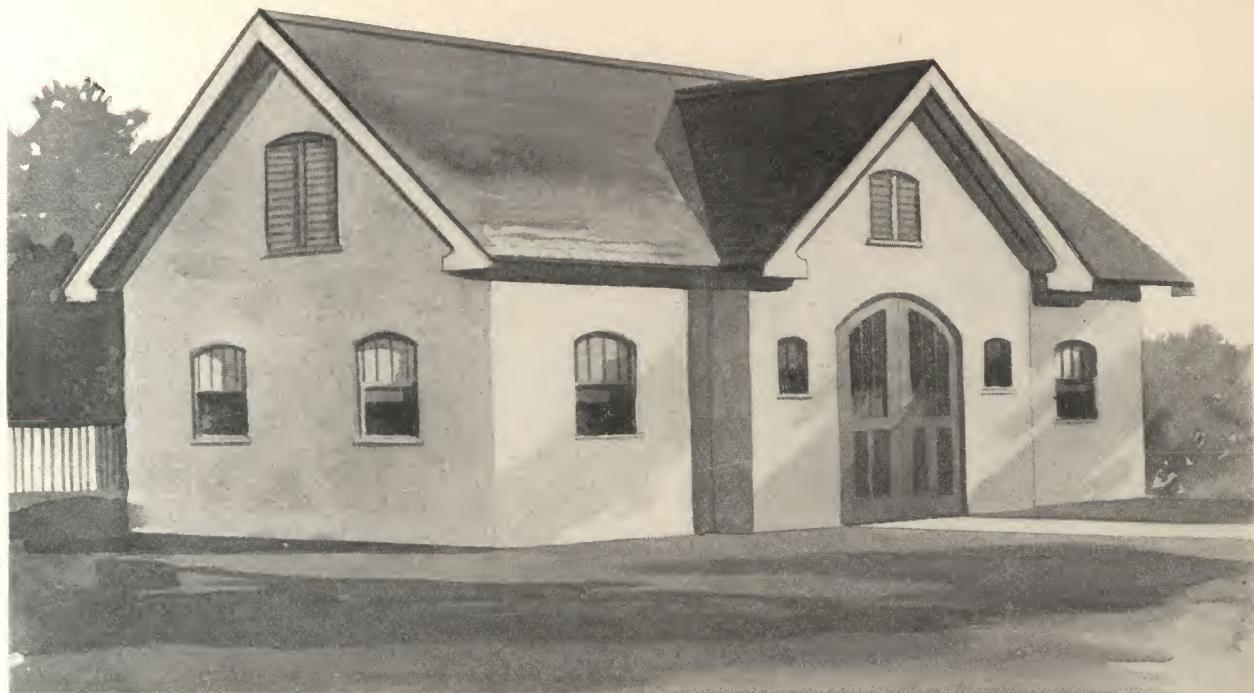
\$6.00

We mail plans and specifications the same day order is received.



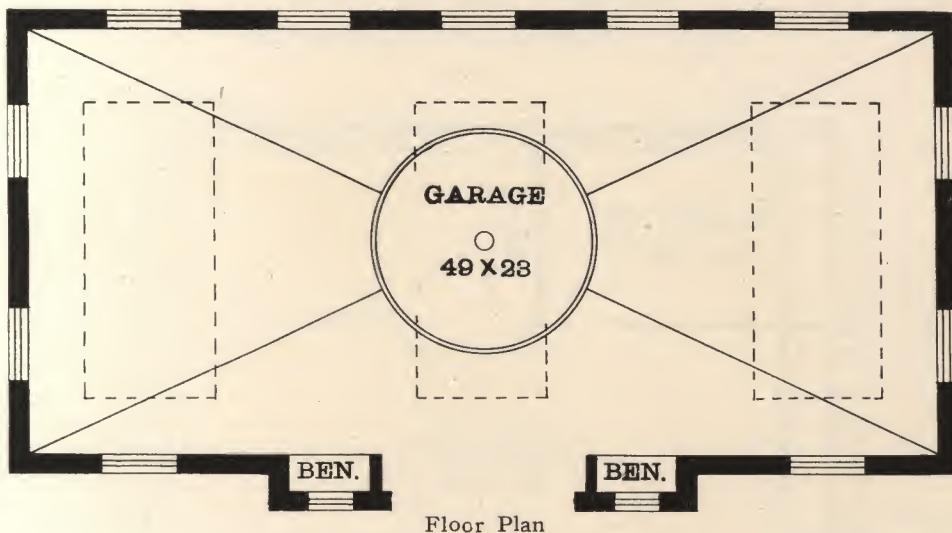
Blue Prints consist of floor plan; front, rear, two side elevations; wall sections and all necessary details. Specifications are type-written and contain all the information necessary for the proper construction of the building.

Old English design in stucco, for private garage with accommodations for two machines. Estimated cost of construction from about \$700.00 to about \$750.00.



Design No. G-119

SIZE: Width, 51 feet; Length, 27 feet.



PRICE

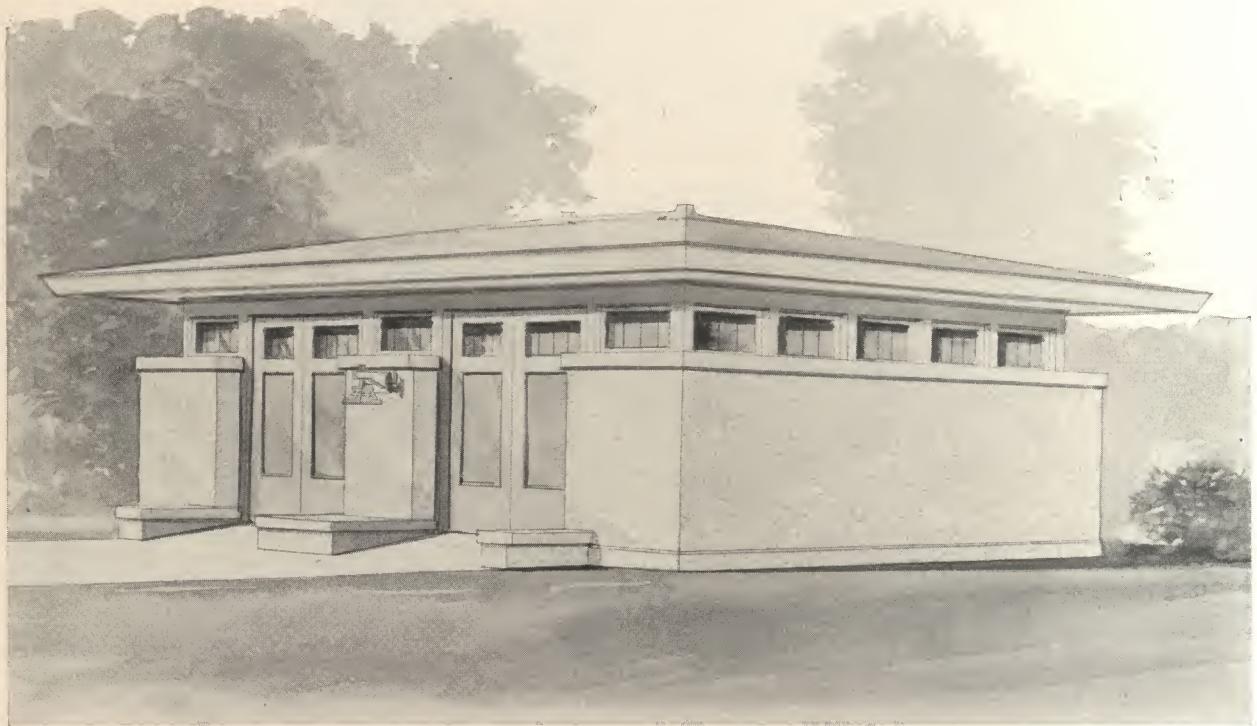
of Blue Prints, together with a complete set of typewritten specifications,

ONLY

\$10.00

We mail plans and specifications the same day order is received.

Neat design for private garage of stucco. Will accommodate three machines and has large turntable with drain. The work benches are located at either side of the entrance. Estimated cost of construction from about \$1,100.00 to about \$1,200.00.



Design No. G-136

SIZE: Width, 35 feet; Length, 30 feet.

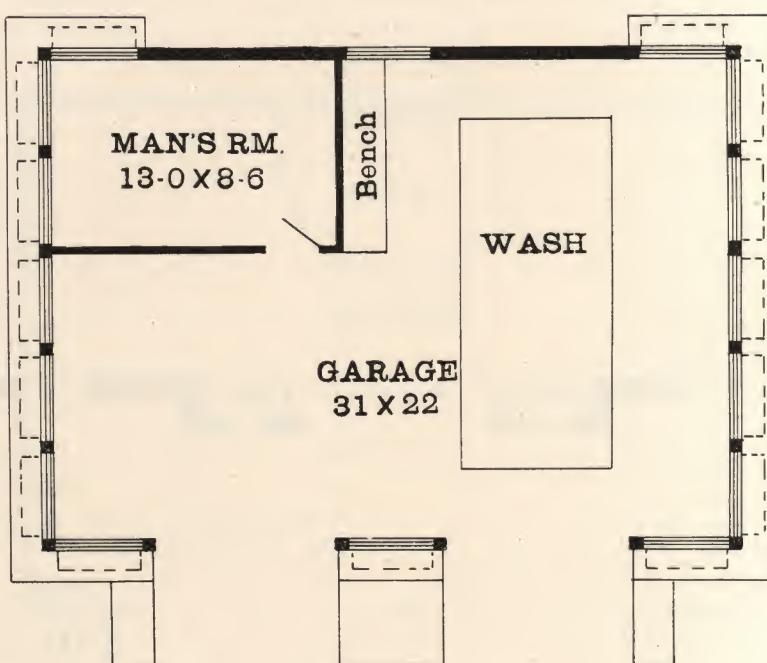
PRICE

of Blue Prints, together with a complete set of typewritten specifications,

ONLY

\$10.00

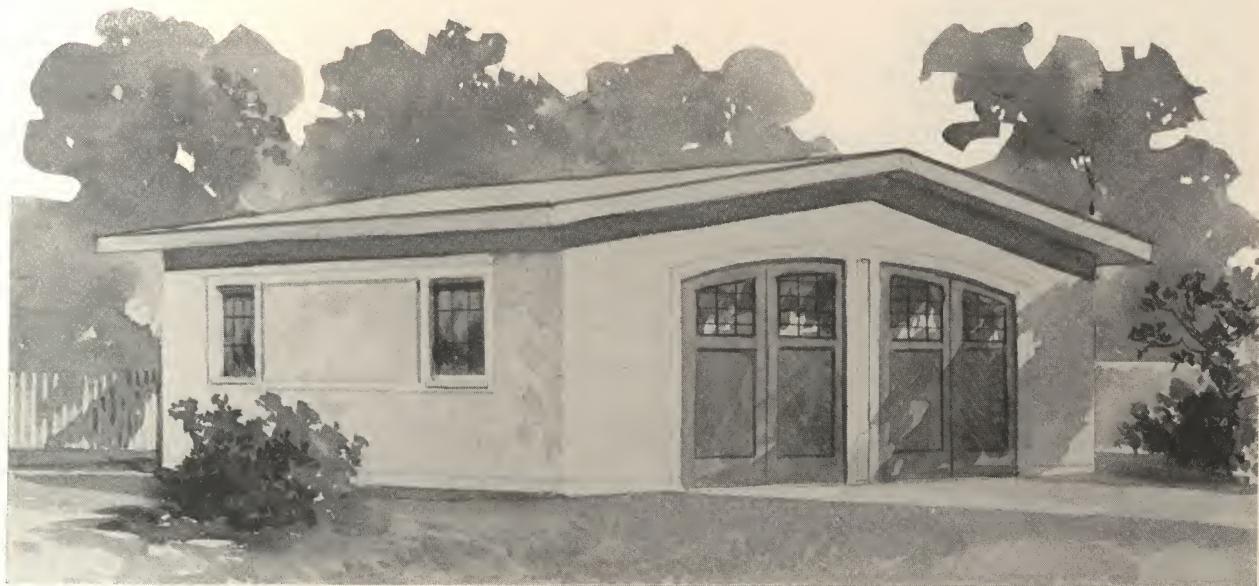
We made plans and specifications the same day order is received.



Floor Plan

Blue Prints consist of floor plan; front, rear, two side elevations; wall selections and all necessary details. Specifications are typewritten and contain all the information necessary for the proper construction of the building.

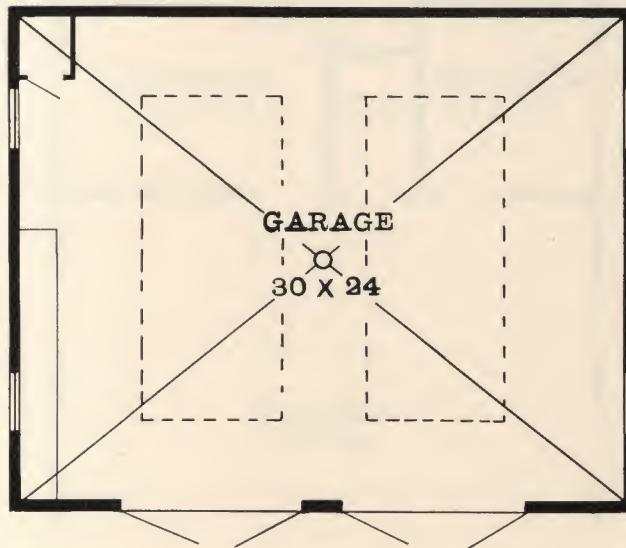
Handsome design for private garage of stucco. A pleasing feature of this design is the small windows on four sides. The projecting wall under windows provides room for a continuous row of cupboards and closets to be used for storage purposes. Estimated cost of construction from about \$1,000.00 to about \$1,200.00.



Design No. G-107

SIZE: Width, 31 feet; Length, 25 feet.

Blue Prints consist of floor plan; front, rear, two side elevations; wall sections and all necessary details. Specifications are typewritten and contain all the information necessary for the proper construction of the building.



Floor Plan

PRICE

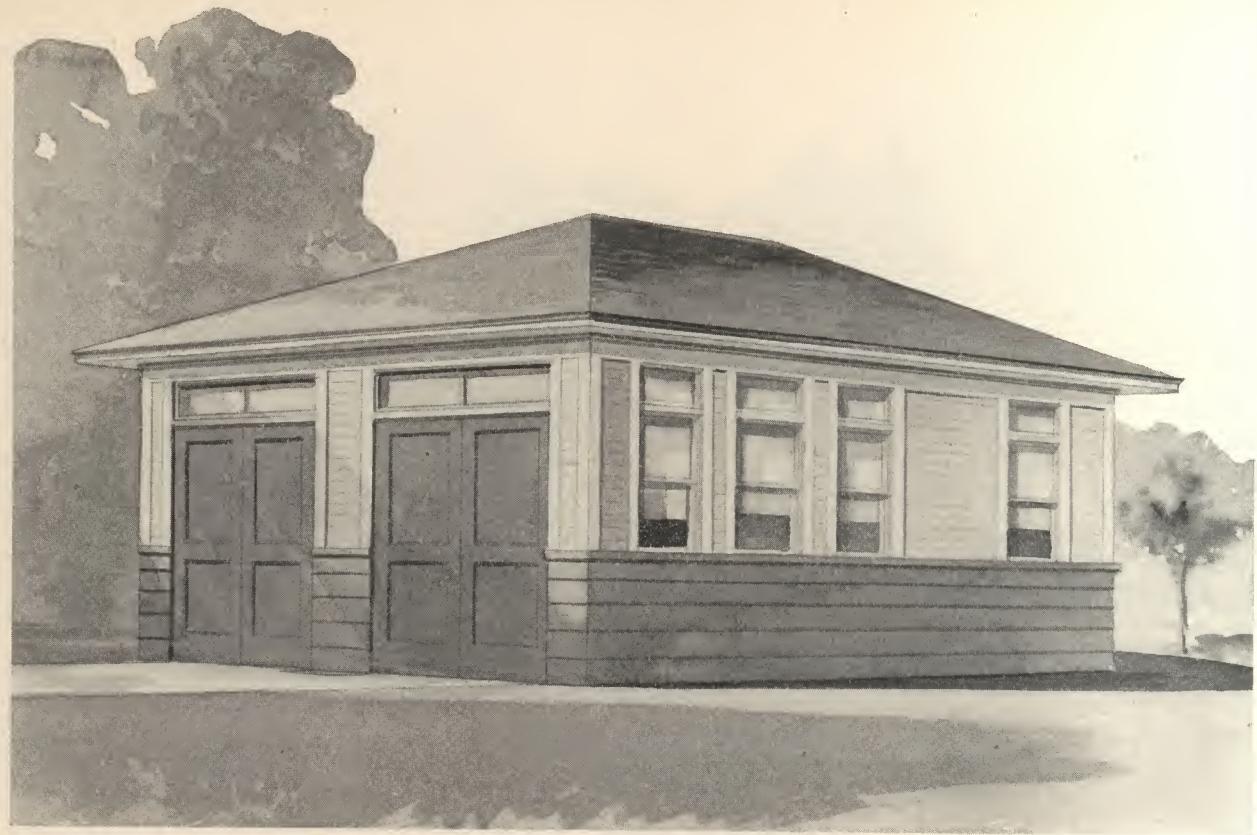
of Blue Prints, together with a complete set of typewritten specifications,

ONLY

\$6.00

We mail plans and specifications the same day order is received.

Attractive design in stucco for private garage, with accommodations for two machines. Estimated cost of construction from about \$800.00 to about \$900.00.



Design No. G-139

SIZE: Width, 27 feet; Length, 33 feet 6 inches.

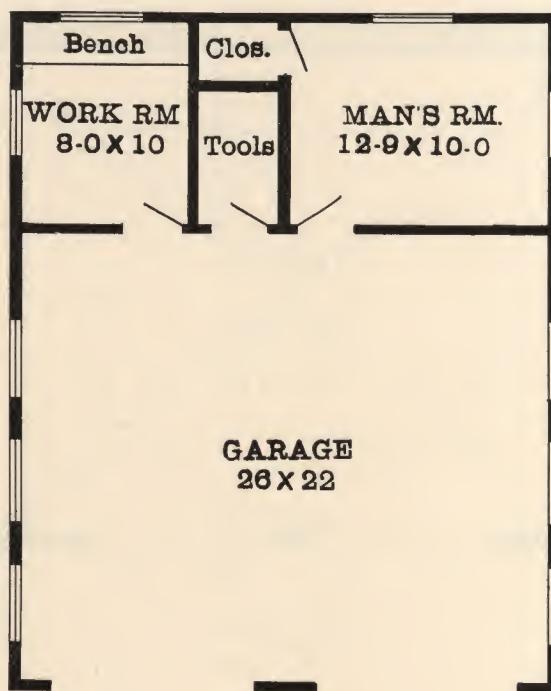
PRICE

of Blue Prints, together with a complete set of typewritten specifications,

ONLY

\$8.00

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Floor Plan

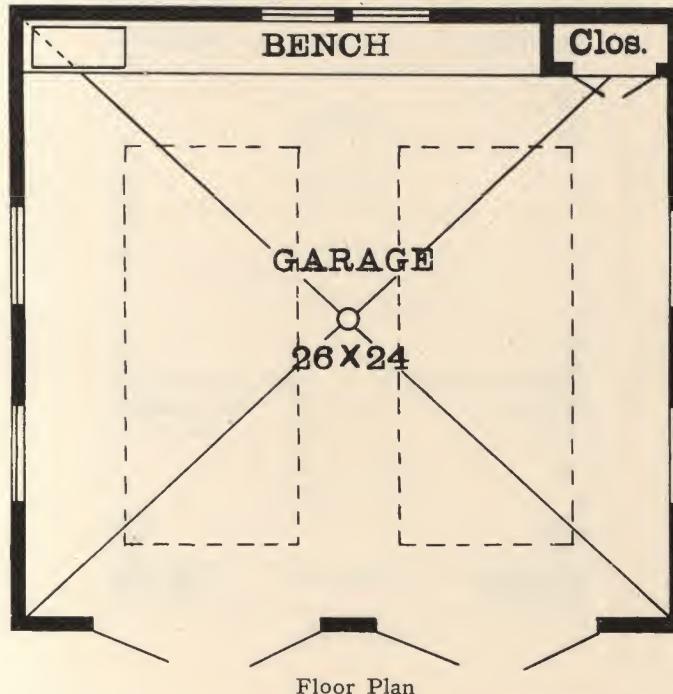
Blue Prints consist of floor plan; front, rear, two side elevations; wall sections and all necessary details. Specifications are typewritten and contain all the information necessary for the proper construction of the building.

Neat and attractive design for a frame garage that will accommodate two machines, in addition to man's room, work room, etc. Estimated cost of construction from about \$700.00 to about \$800.00.



Design No. G-112

SIZE: Width, 27 feet; Length, 25 feet.



Blue Prints consist of floor plan; front, rear, two side elevations; wall sections and all necessary details. Specifications are typewritten and contain all the information necessary for the proper construction of the building.

PRICE

of Blue Prints, together with a complete set of typewritten specifications,

ONLY

\$5.00

We mail plans and specifications the same day order is received.

Practical design for private garage of frame construction with accommodation for two machines. Estimated cost of construction from about \$650.00 to about \$700.00.



Design No. G-143

SIZE: Width, 25 feet; Length, 36 feet.

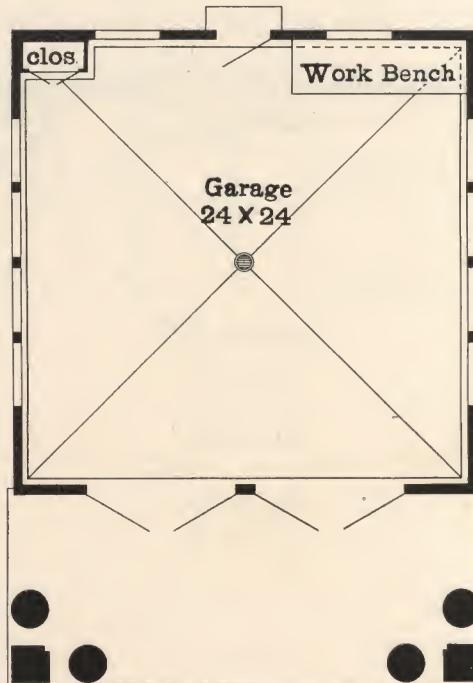
PRICE

of Blue Prints, together with a complete set of typewritten specifications,

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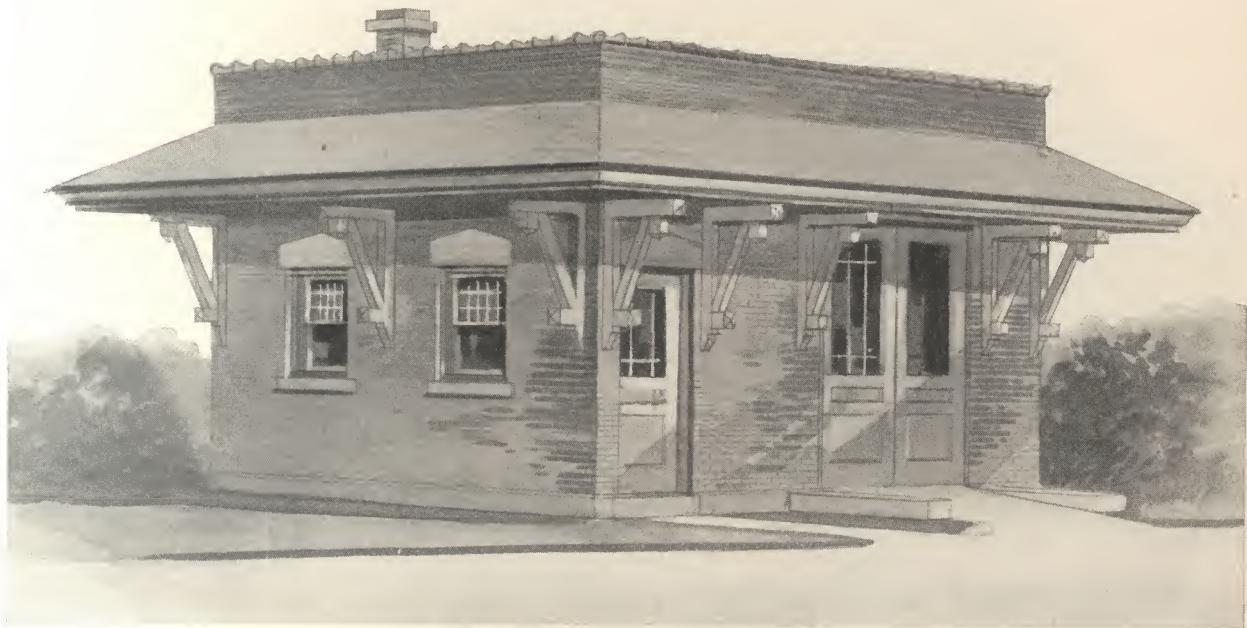
We mail plans and specifications the same day order is received.



Floor Plan

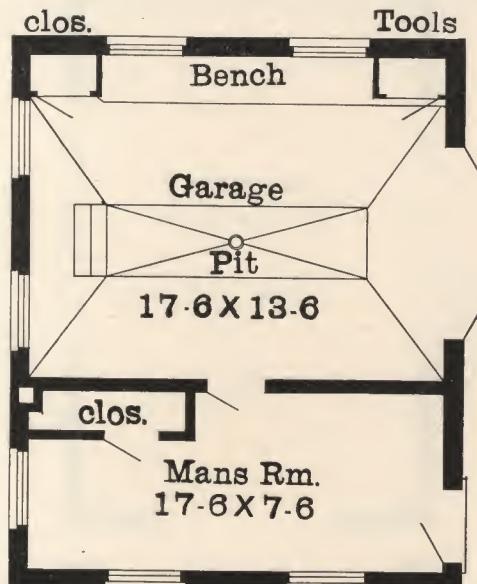
Blue Prints consist of floor plan; front, rear, two side elevations; wall sections and all necessary details. Specifications are typewritten and contain all the information necessary for the proper construction of the building.

Doric design in stucco for small private garage. Very handsome entrance with massive columns at either side. Estimated cost of construction from about \$800.00 to about \$900.00.



Design No. G-149

SIZE: Width, 23 feet; Length, 19 feet.



Blue Prints consist of floor plan; front, rear, two side elevations; wall sections and all necessary interior details.

Specifications are typewritten and contain all the information necessary for the proper construction of the building.

PRICE

of Blue Prints, together with a complete set of typewritten specifications,

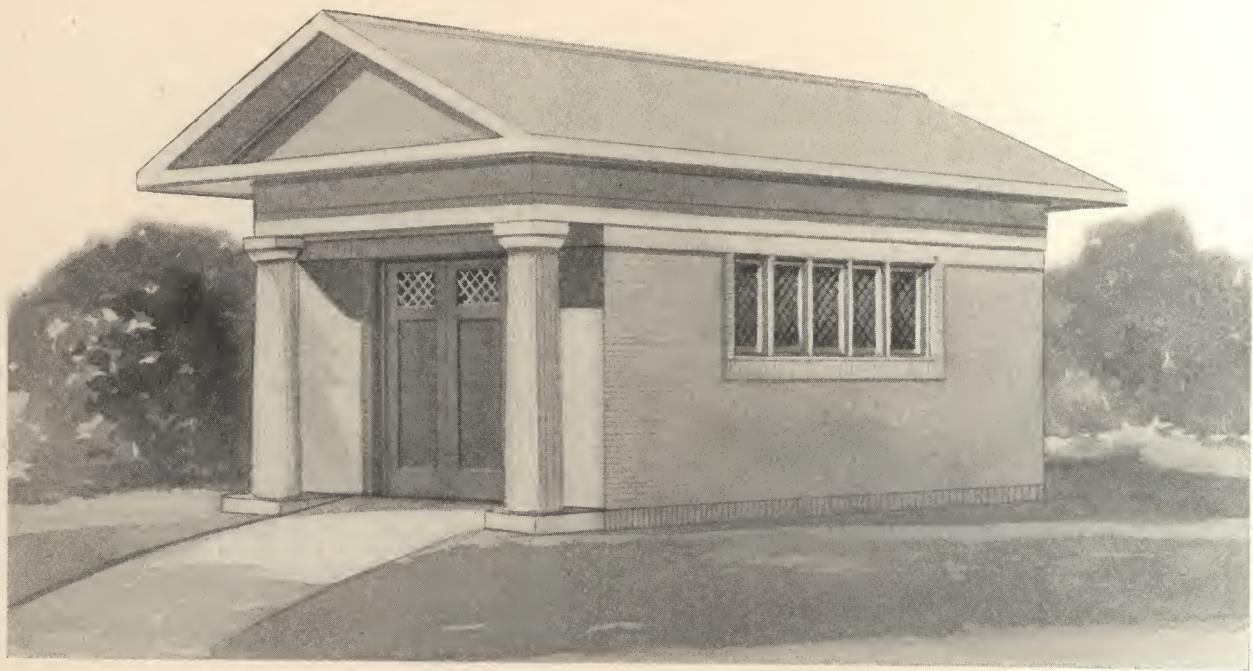
ONLY

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Floor Plan

Handsome design in brick for small private garage, with accommodation for one machine. Located at one side is the man's room. The wide cornice with the hanging brackets produces a very pleasing effect. The estimated cost of construction is from about \$700.00 to about \$750.00.



Design No. G-144

SIZE: Width, 16 feet; Length, 30 feet.

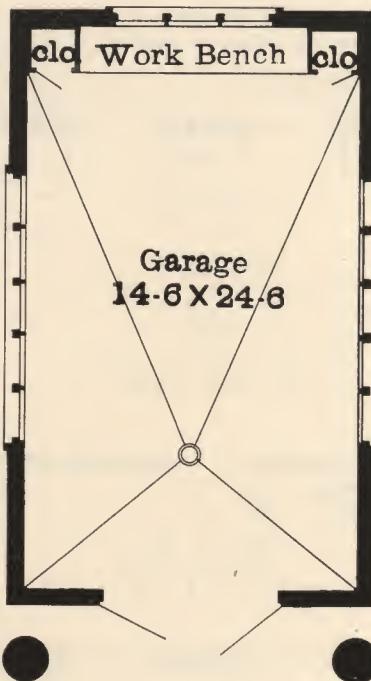
PRICE

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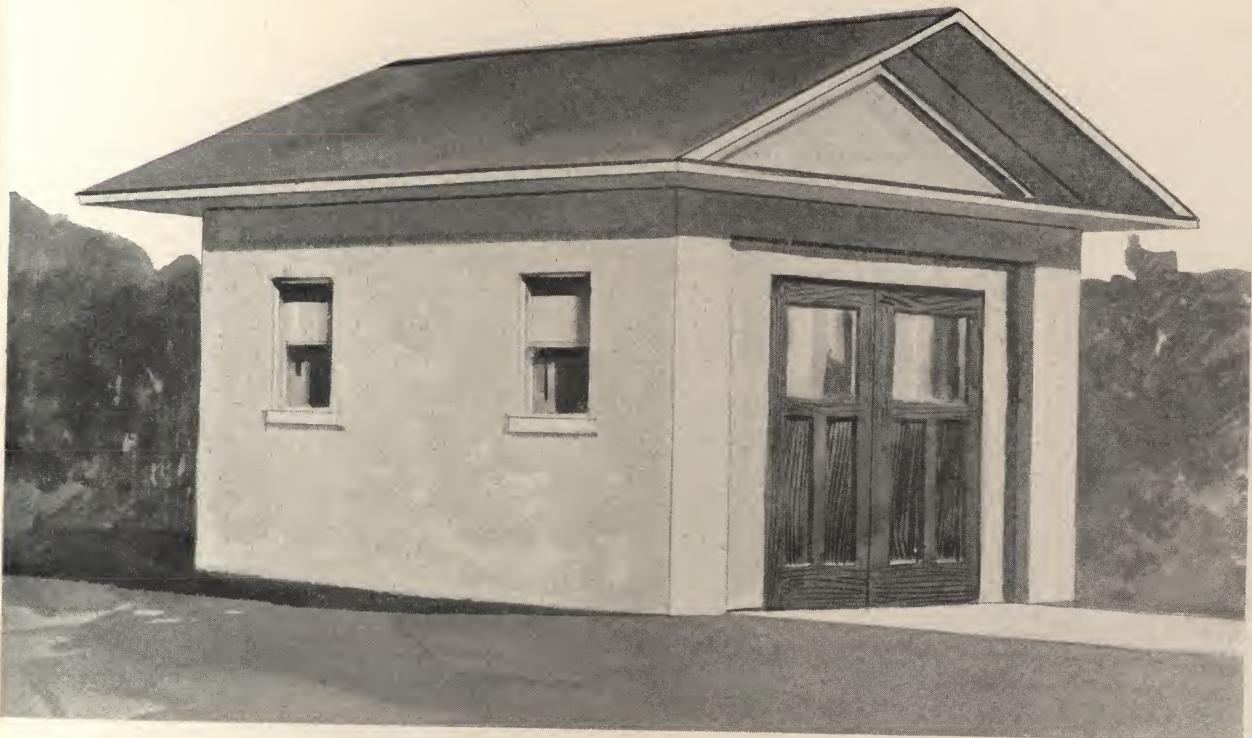
We mail plans and specifications the same day order is received.



Floor Plan

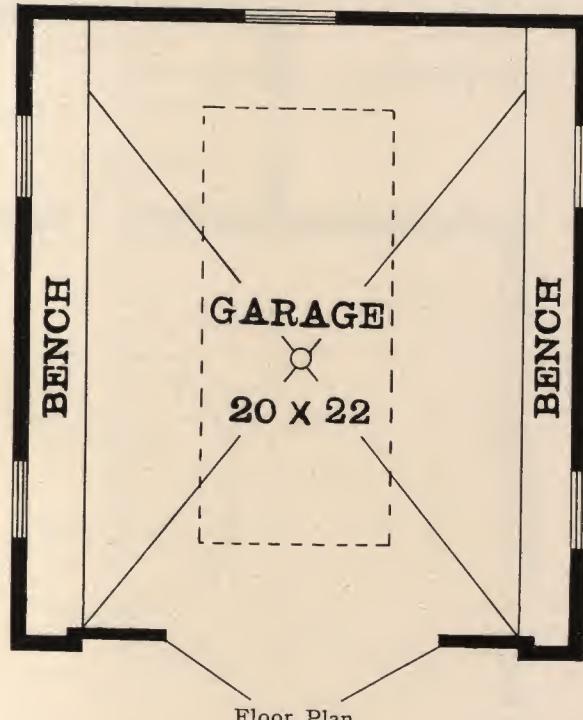
Blue Prints consist of floor plan; front, rear, two side elevations; wall sections and all necessary details. Specifications are typewritten and contain all the information necessary for the proper construction of the building.

Classic design in brick for small private garage to accommodate one machine. The colonial columns at either side of the entrance and the small latticed windows on the sides makes it a very pleasing and attractive design. Estimated cost of construction from about \$500.00 to about \$550.00.



Design No. G-128

SIZE: Width, 21 feet; Length, 23 feet.



Floor Plan

PRICE

of Blue Prints, together with
a complete set of typewrit-
ten specifications

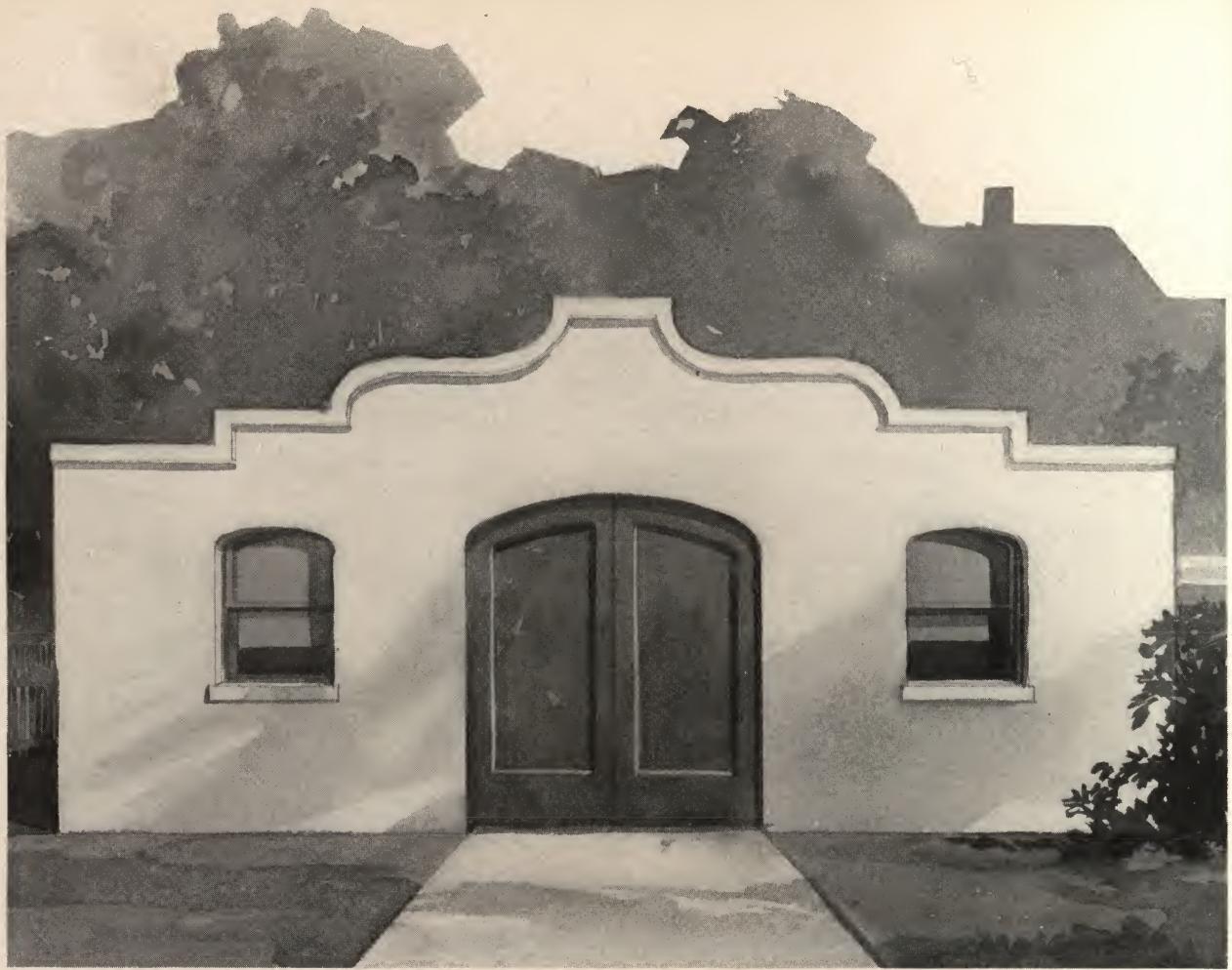
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fications the same day order
is received.

Blue Prints consist of
floor plans; front, rear, two
side elevations; wall sections
and all necessary details.
Specifications are typewrit-
ten and contain all the in-
formation necessary for the
proper construction of the
building.

Neat design in stucco for small private garage with work benches running full length of side walls. Estimated cost of construction from about \$500.00 to about \$550.00.



Design No. G-142

SIZE: Width, 37 feet; Length, 33 feet.

Blue Prints consist of floor plan; front, rear, two side elevations; wall sections and all necessary details. Specifications are typewritten and contain all the information necessary for the proper construction of the building.

PRICE

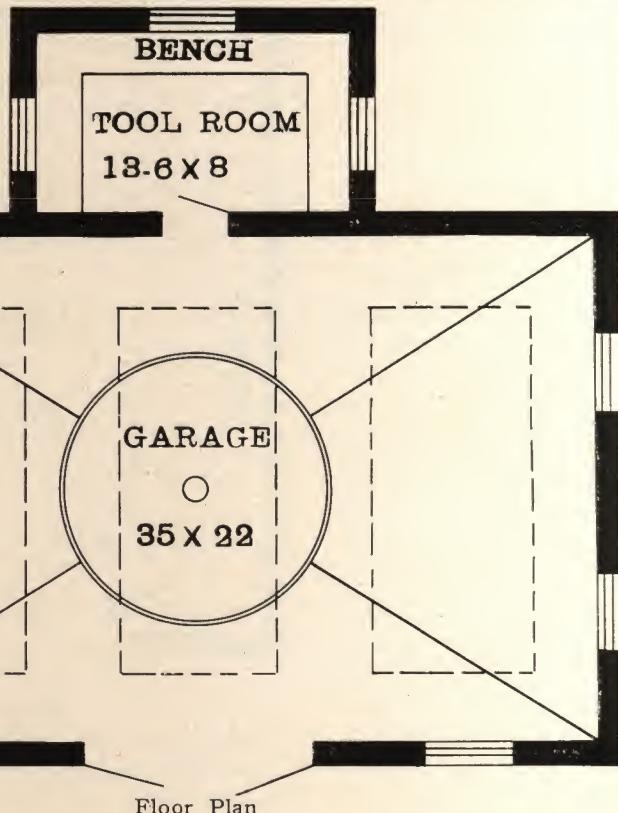
of Blue Prints, together with a complete set of typewritten specifications,

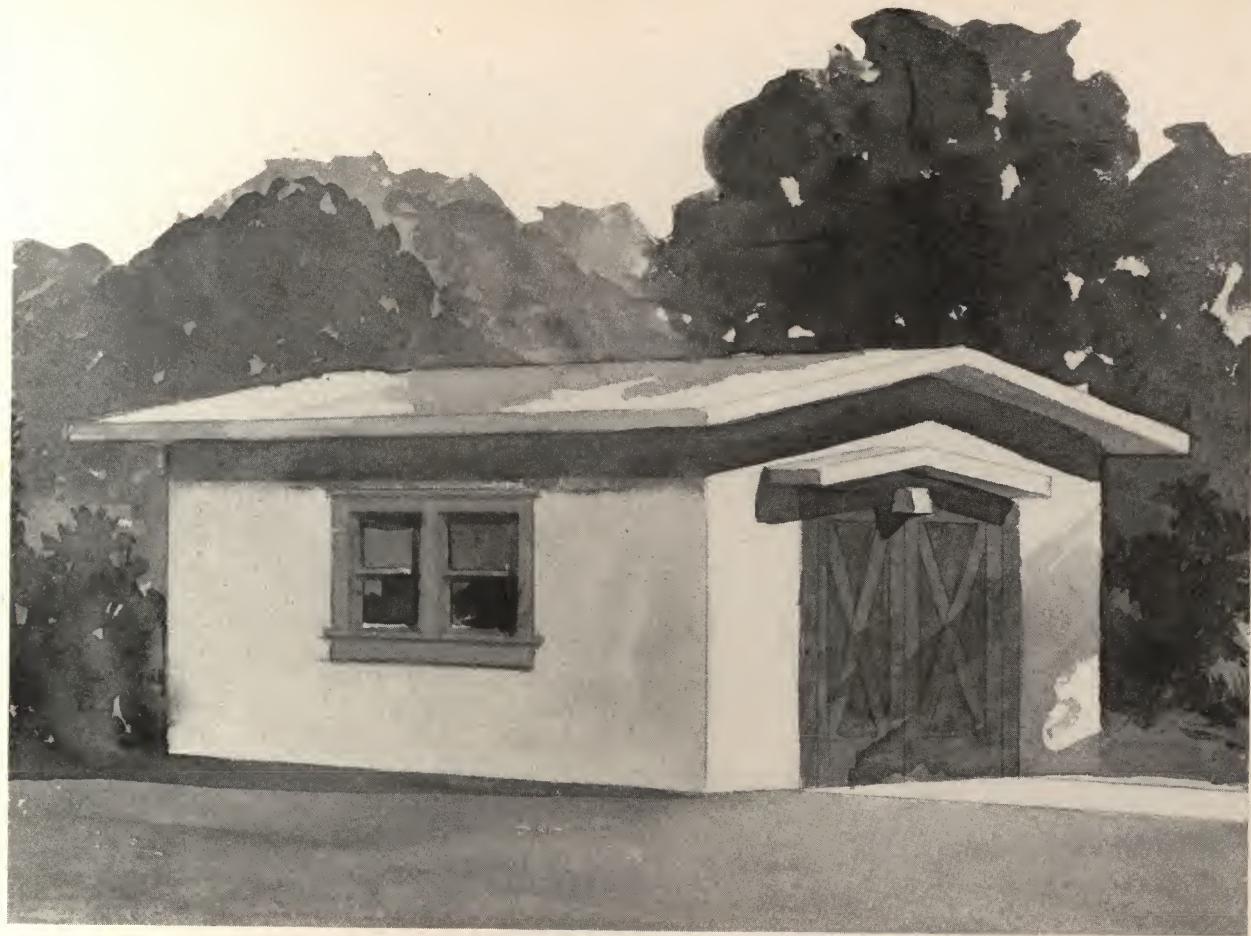
ONLY

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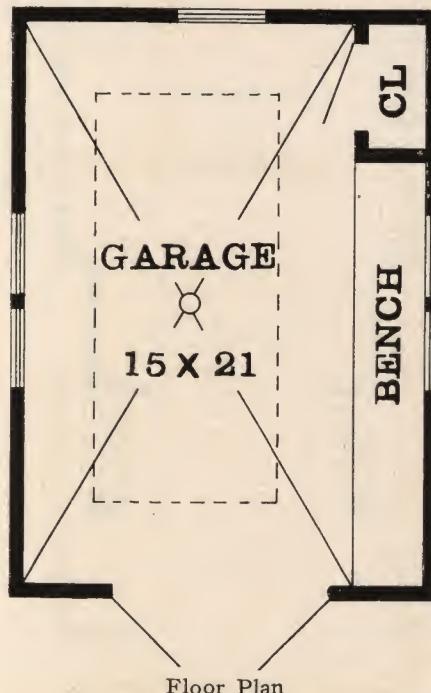
Spanish design in brick and stone for private garage with provision for three machines. Large turntable with drain located in the center of garage proper. Located at the rear with entrance from the garage is a tool room, well lighted on three sides, and work bench under windows. Estimated cost of construction from about \$850.00 to about \$950.00.





Design No. G-126

SIZE: Width, 16 feet; Length, 22 feet.



Blue Prints consist of floor plans; front, rear, two side elevations; wall sections and all necessary details. Specifications are typewritten and contain all the information necessary for the proper construction of the building.

PRICE

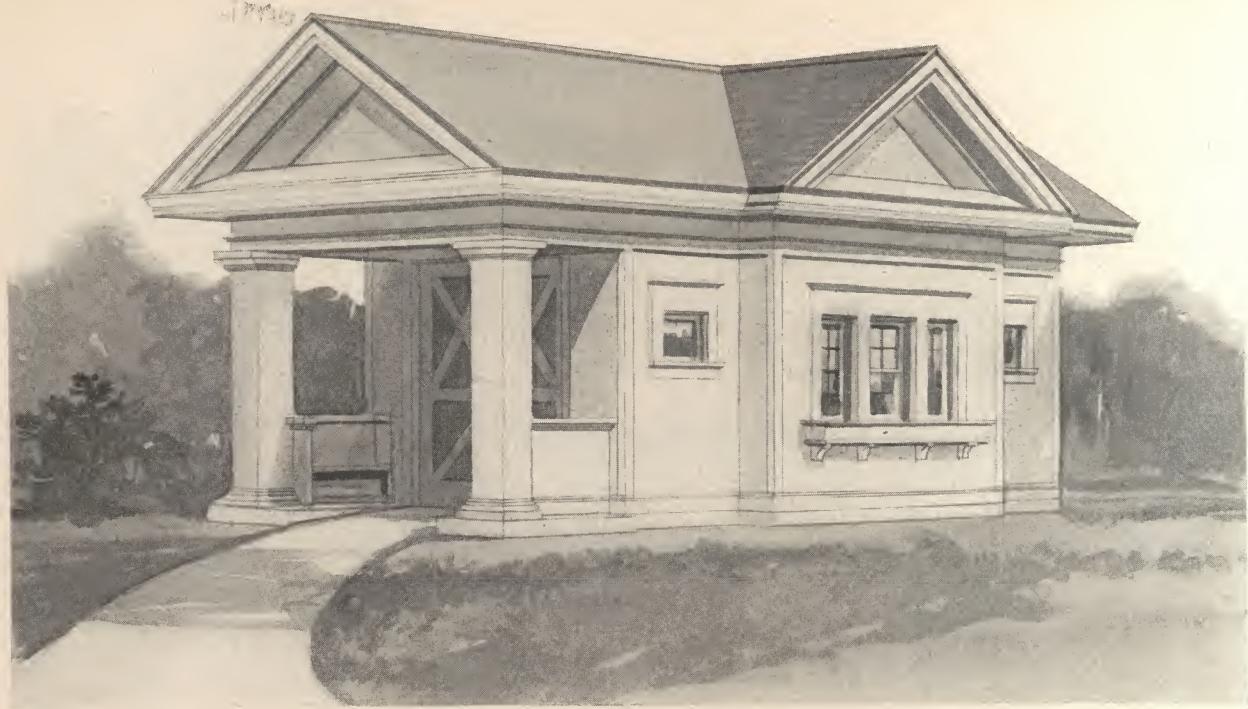
of Blue Prints, together with a complete set of typewritten specifications,

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We mail plans and specifications the same day order is received.

Very attractive Mission design in stucco for small private garage. Estimated cost of construction from about \$450.00 to about \$550.00.



Design No. G-146

SIZE: Width, 17 feet; Length, 32 feet.

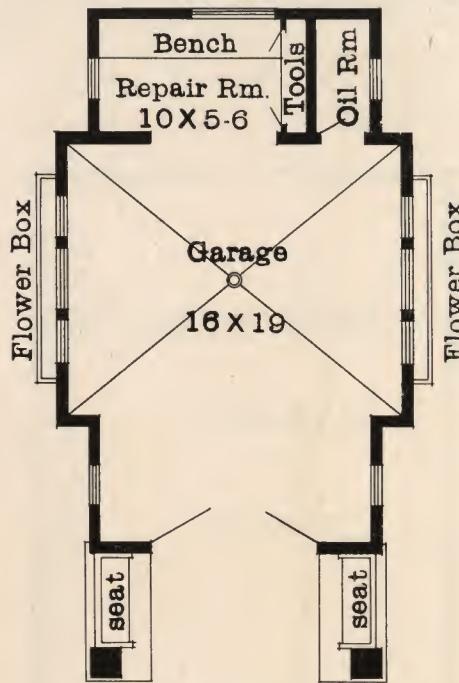
PRICE

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Floor Plan

Handsome design for private garage of stucco. The garage proper is 16 ft. by 19 ft. and opening off of it is a small repair room with work bench and tool closet and also a storage room for oil. A pleasing feature of this particular design is the stucco seats at either side of the entrance. The window box under the side windows allows for the planting of vines and flowers and will add materially to the beauty of the building. Estimated cost of construction from about \$800.00 to about \$900.00.

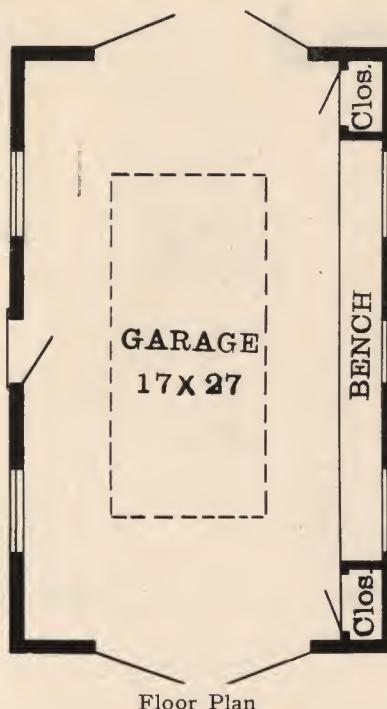
Blue Prints consist of floor plan; front, rear, two side elevations; wall sections and all necessary details.

Specifications are typewritten and contain all the information necessary for the proper construction of the building.



Design No. G-103

SIZE: Width, 18 feet; Length, 28 feet.



Blue Prints consist of floor plan; front, rear, two side elevations; wall sections and all necessary interior details.

Specifications are typewritten and contain all the information necessary for the proper construction of the building.

PRICE

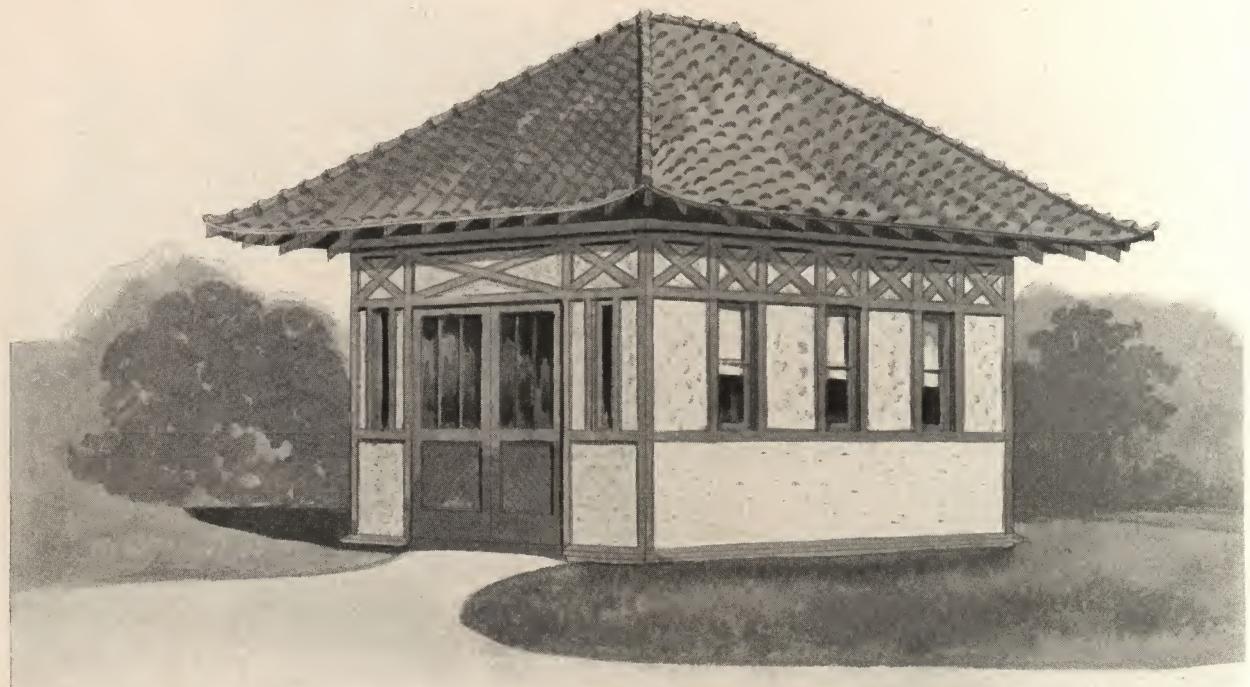
of Blue Prints, together with a complete set of typewritten specifications,

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\$5.00

We mail plans and specifications the same day order is received.

Neat design for small private garage of stucco, with tile roof. Estimated cost of construction from about \$450.00 to about \$500.00.



Design No. G-151

SIZE: Width, 17 feet; Length, 21 feet.

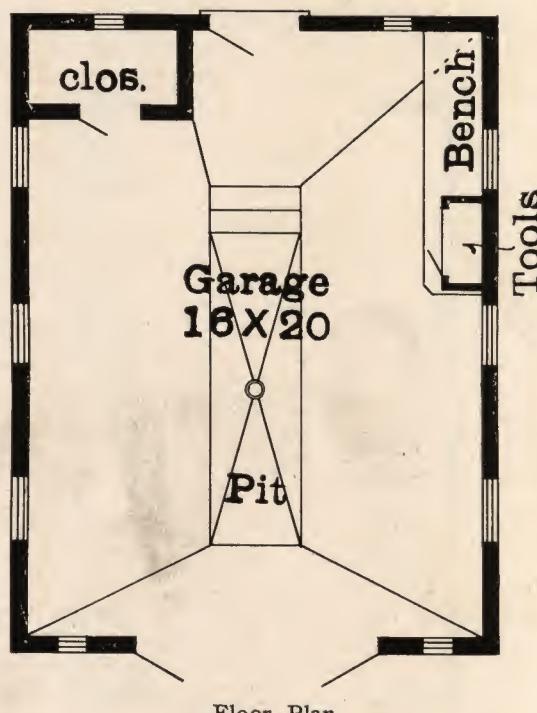
PRICE

of Blue Prints, together with a complete set of typewritten specifications,

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\$8.00

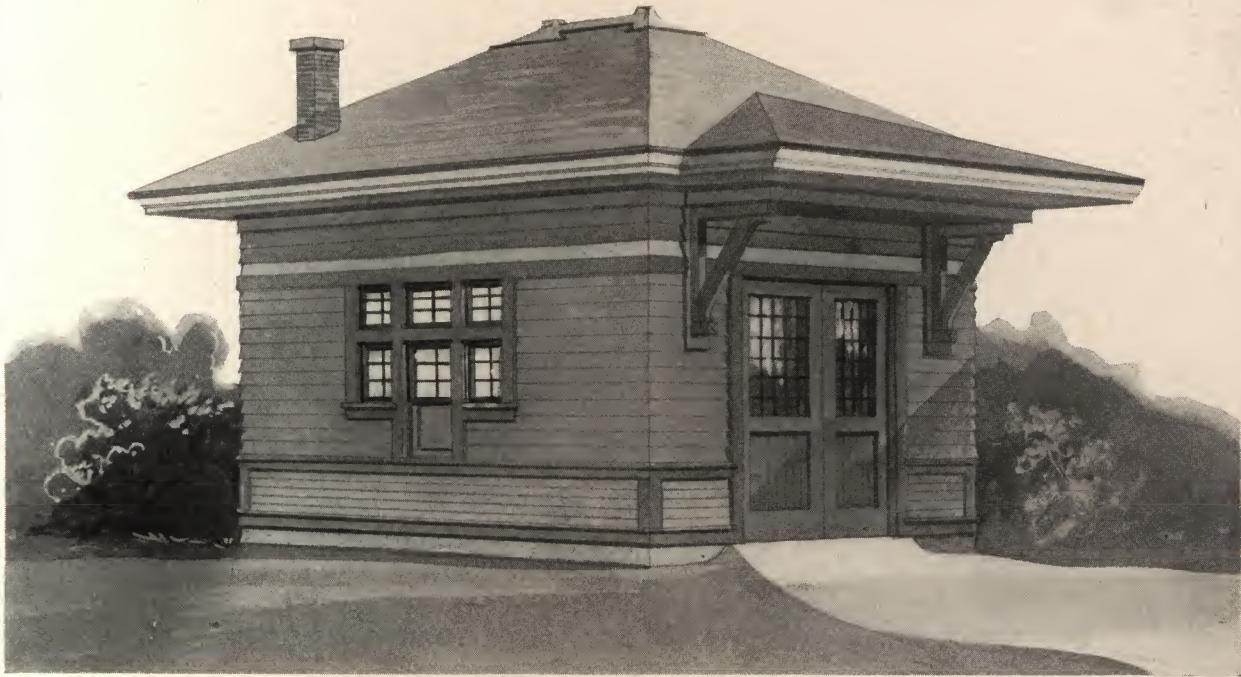
We mail plans and specifications the same day order is received.



Blue Prints consist of floor plan; front, rear, two side elevations; wall sections and all necessary details.

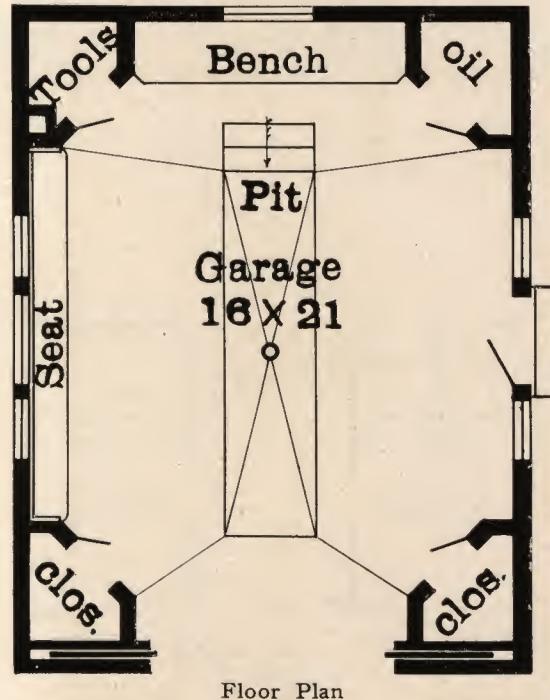
Specifications are typewritten and contain all the information necessary for the proper construction of the building.

Chinese design for small private garage to be built of stucco with tile roof. Estimated cost of construction from about \$600.00 to about \$700.00.



Design No. G-148

SIZE: Width, 17 feet; Length, 22 feet.



Blue Prints consist of floor plan; front, rear, two side elevations; wall sections and all necessary details. Specifications are typewritten and contain all the information necessary for the proper construction of the building.

PRICE

of Blue Prints, together with a complete set of typewritten specifications,

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Artistic design in frame for small private garage for the storage of one machine. The corners are partitioned off into small closets for the safe keeping of oils, tools, supplies, etc., while the work bench is located at one side. On the opposite side there is an opening into the yard so that it is not always necessary to use the large double doors in front. Estimated cost of construction from about \$400.00 to about \$500.00.



Design No. G-153

SIZE: Width, 30 feet; Length, 40 feet.

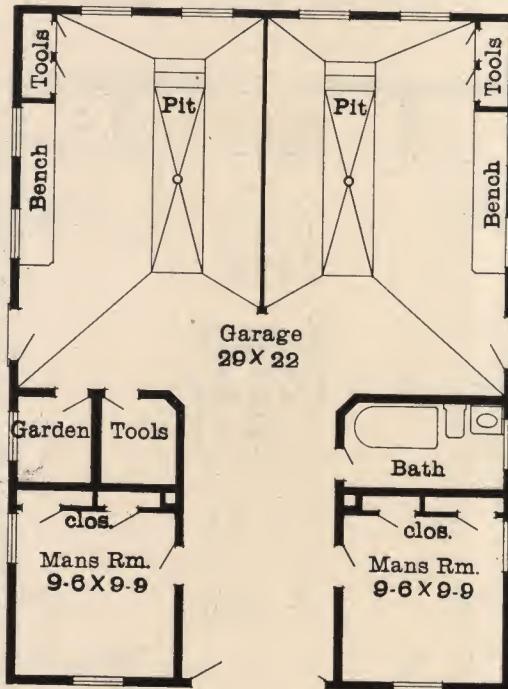
PRICE

of Blue Prints, together with a complete set of typewritten specifications,

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Floor Plan

Effective design for frame garage built on a lot line for the use of two separate families, with driveway on the line. In addition to the space necessary for the storage of the machines and the tool closets and work benches, provision has been made for sleeping quarters for chauffeurs or care-takers. The estimated cost of construction is from about \$1,500.00 to about \$1,700.00.

Blue Prints consist of floor plan; front, rear, two side elevations; wall sections and all necessary details.

Specifications are typewritten and contain all the information necessary for the proper construction of the building.



Design No. G-138

SIZE: Width, 26 feet, 9 inches; Length, 24 feet.

Blue Prints consist of floor plan; front, rear, two side elevations; wall sections and all necessary details. Specifications are typewritten and contain all the information necessary for the proper construction of the building.



Floor Plan

PRICE

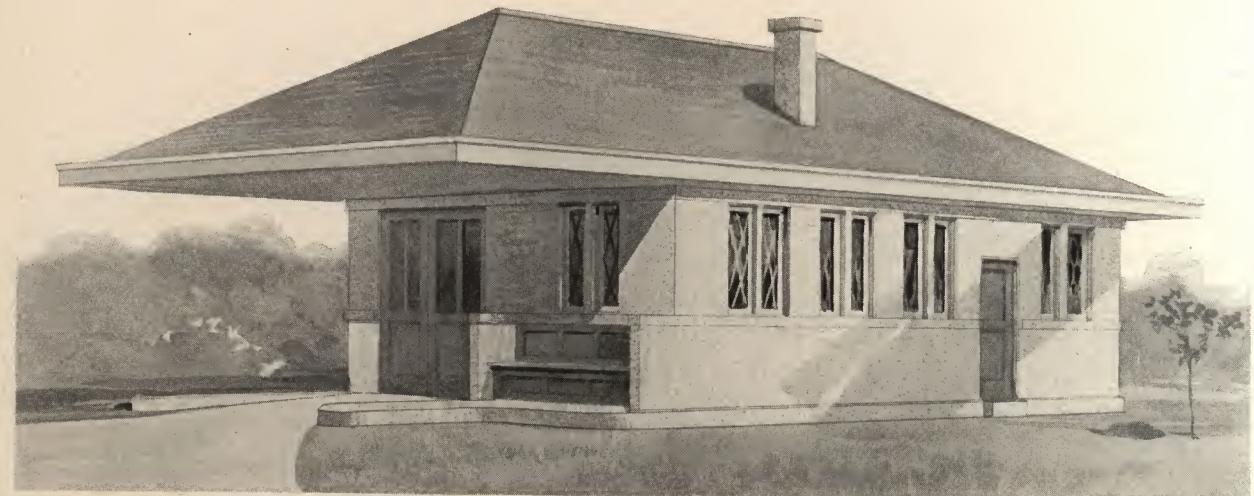
of Blue Prints, together with complete set of typewritten specifications,

ONLY

\$8.00

We mail plans and specifications the same day order is received.

Handsome design in concrete for private garage, with accommodation for two machines. Estimated cost of construction from about \$600.00 to about \$700.00.



Design No. G-154

SIZE: Length, 23 feet; Length, 33 feet, 6 inches.

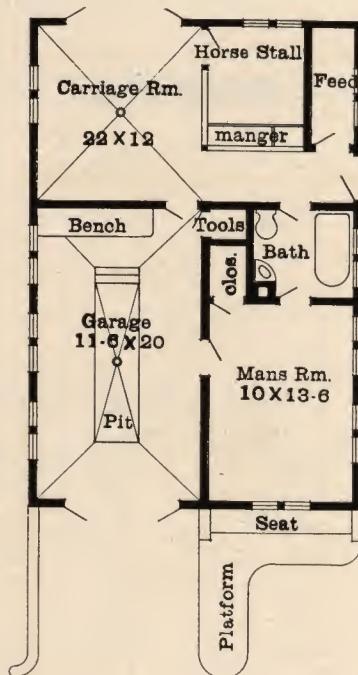
PRICE

of Blue Prints, together with a complete set of typewritten specifications,

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\$10.00

We mail plans and specifications the same day order is received.

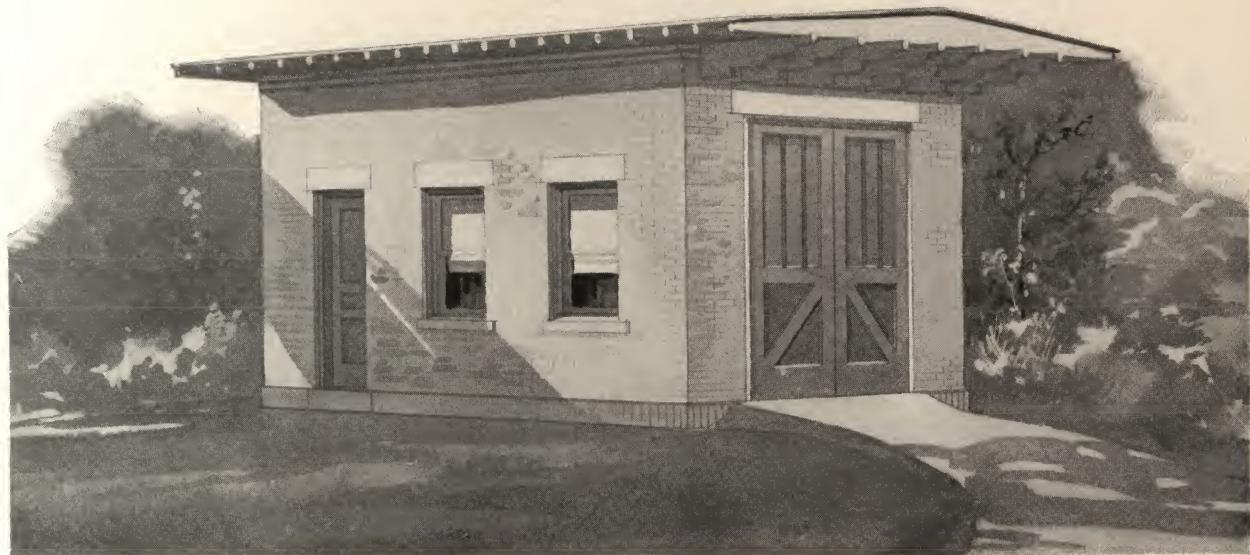


Floor Plan

Blue Prints consist of floor plan; front, rear, two side elevations; wall sections and all necessary interior details.

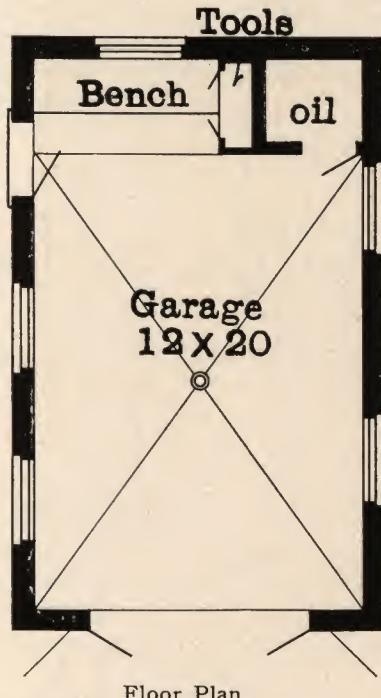
Specifications are typewritten and contain all the information necessary for the proper construction of the building.

Very artistic design for private combined garage and stable to be built of stucco. In addition to the space required for the machine, carriage, stall, etc., provision has been made for man's room, bath, closets, etc. An attractive feature of this design is the porch effect obtained by the overhanging roof and the seat at right of entrance. The estimated cost of construction is from about \$1,000.00 to about \$1,200.00.



Design No. G-147

SIZE: Width, 13 feet, 6 inches; Length, 21 feet, 6 inches.



Blue Prints consist of floor plan; front, rear, two side elevations; wall sections and all necessary details.

Specifications are typewritten and contain all the information necessary for the proper construction of the building.

PRICE

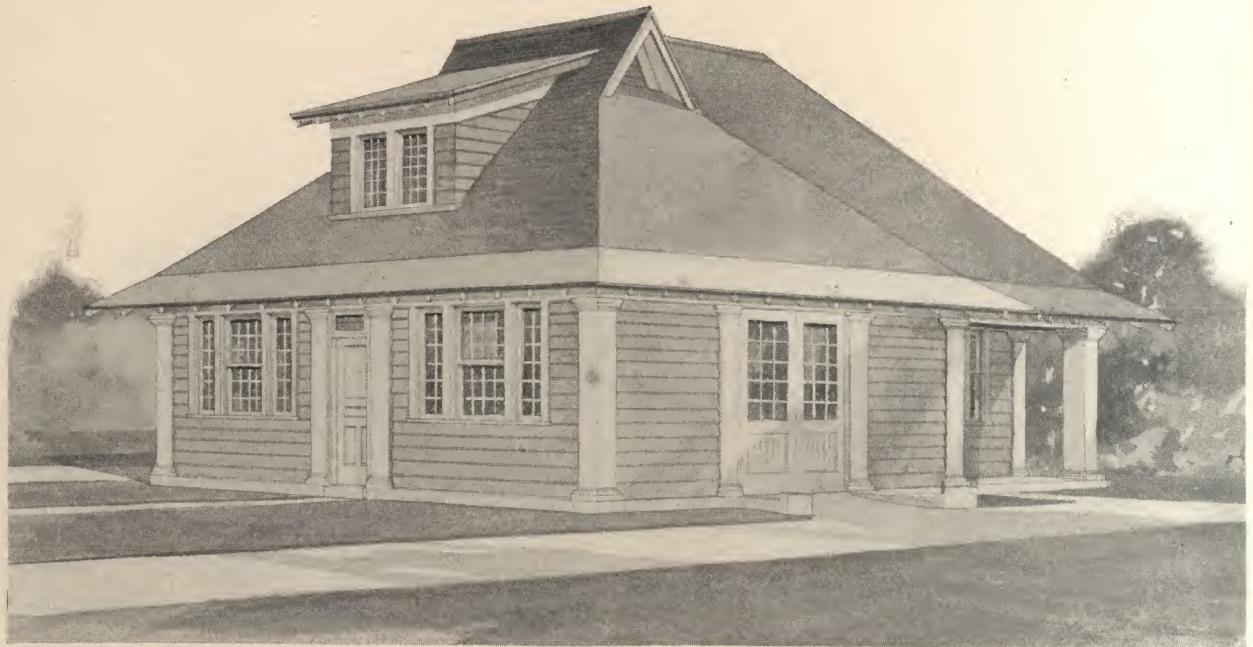
of Blue Prints, together with complete set of typewritten specifications,

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\$8.00

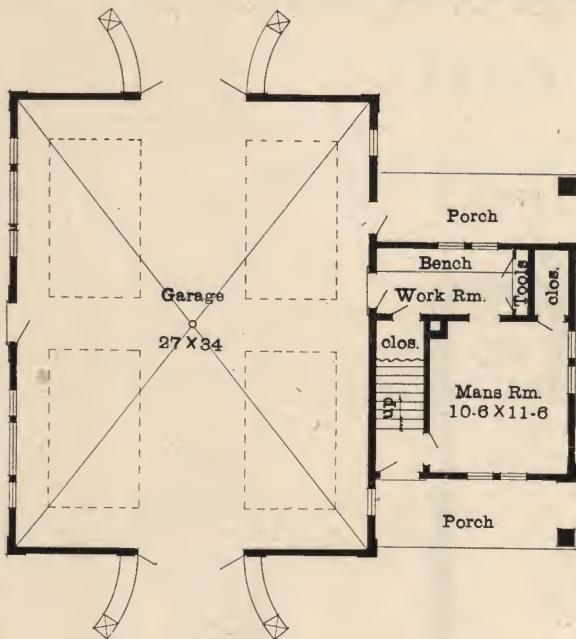
We mail plans and specifications the same day order is received.

Neat but inexpensive design for small private garage to be built of brick, the roof to be constructed of tin. Estimated cost of construction from about \$600.00 to about \$700.00.

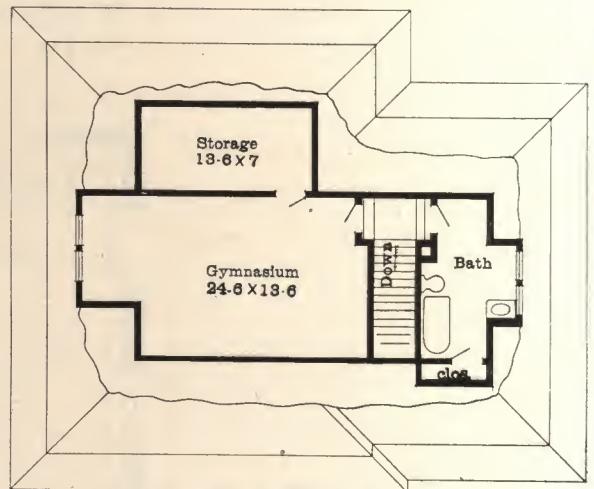


Design No. G-155

SIZE: Width, 43 feet; Length, 35 feet.



First Floor Plan



Second Floor Plan

PRICE

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ONLY

\$18.00

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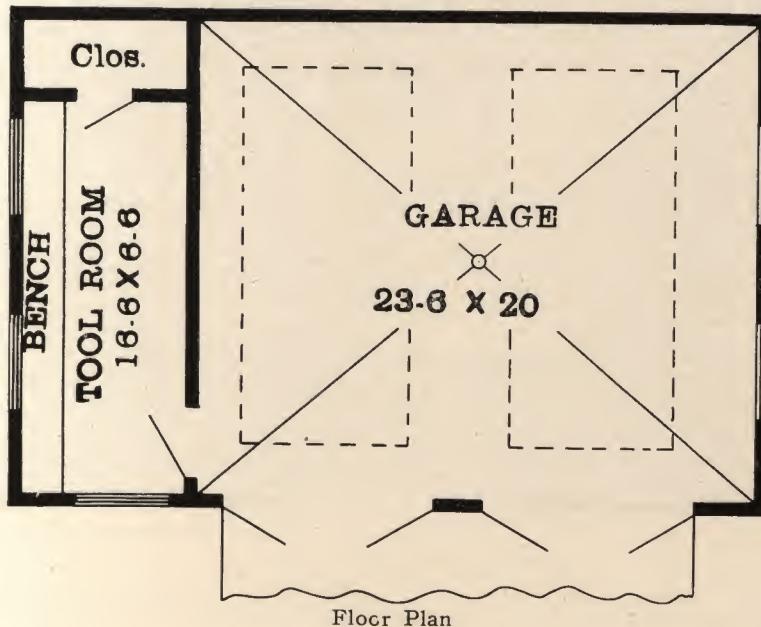
Novel design for large private garage, to be built of frame. The garage proper will accommodate four machines. At the right is located the man's room, closet, work room and bench, while in the attic are located the gymnasium, bath and store room. The estimated cost of construction for a design of this kind is from about \$2,500.00 to about \$3,000.00.

Blue Prints consist of first and second floor plans; front, rear, two side elevations; wall sections and all necessary details. Specifications are typewritten and contain all the information necessary for the proper construction of the building.

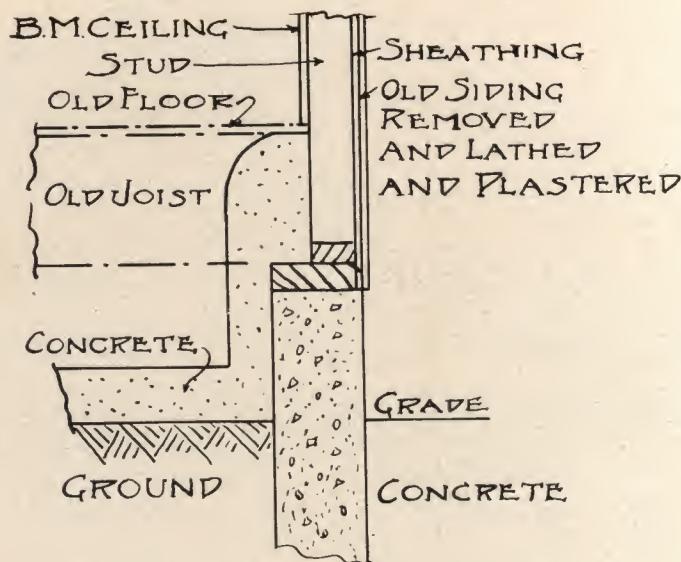


Design No. G-101

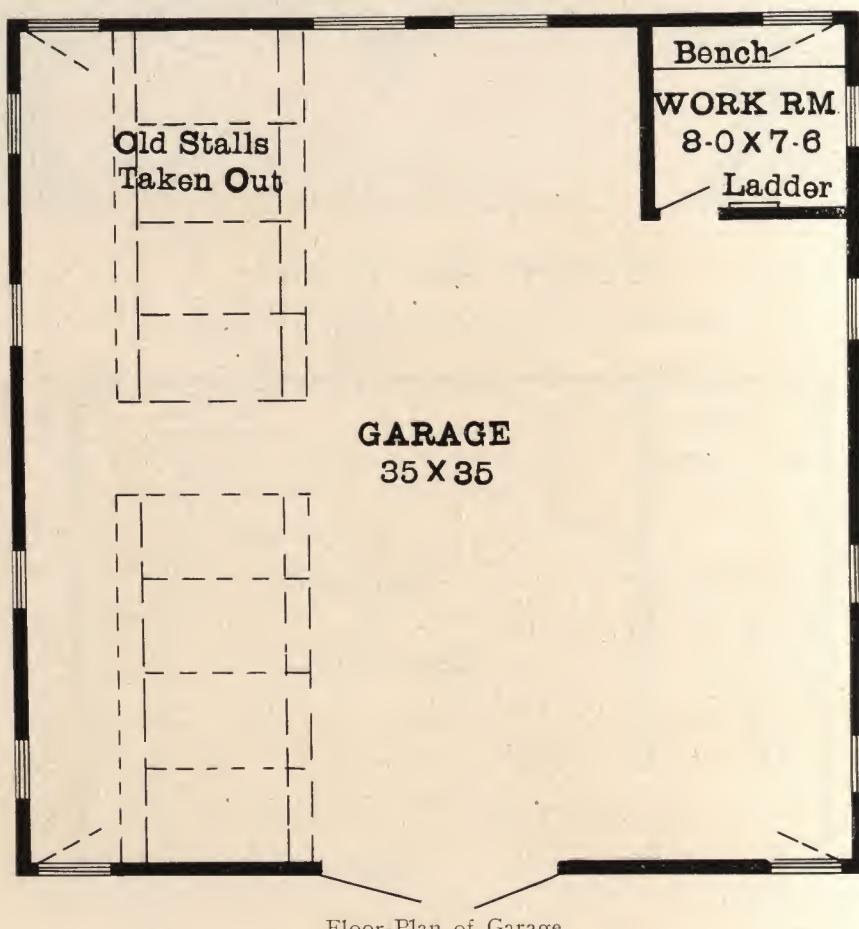
SIZE: Width, 32 feet; Length, 21 feet.



Unique design for private garage of stucco with accommodations for two machines. Located at the left is a tool room with work bench running the entire length of the room. Estimated cost of construction from about \$650.00 to about \$700.00.



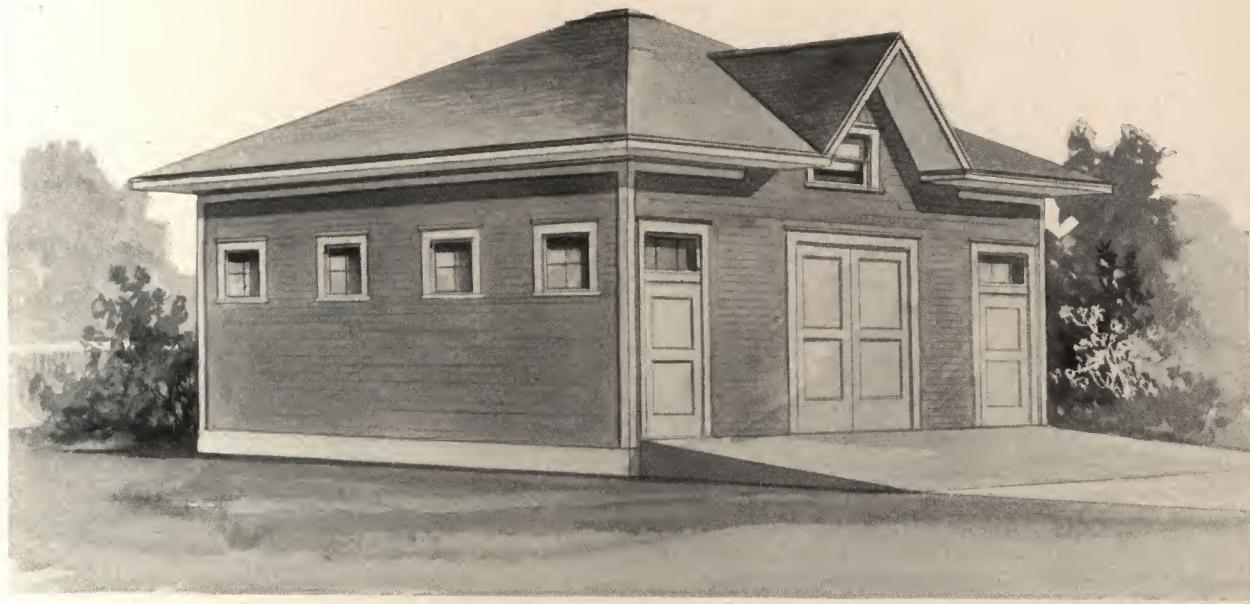
Details of Wall and Floor Construction.



Floor-Plan of Garage.

SECTIONAL DIAGRAM AND FLOOR-PLAN SHOWING METHOD ADOPTED IN TRANSFORMING AN OLD WOOD-FLOOR BARN INTO A GARAGE.

For views of the structure before and after conversion, see opposite page.



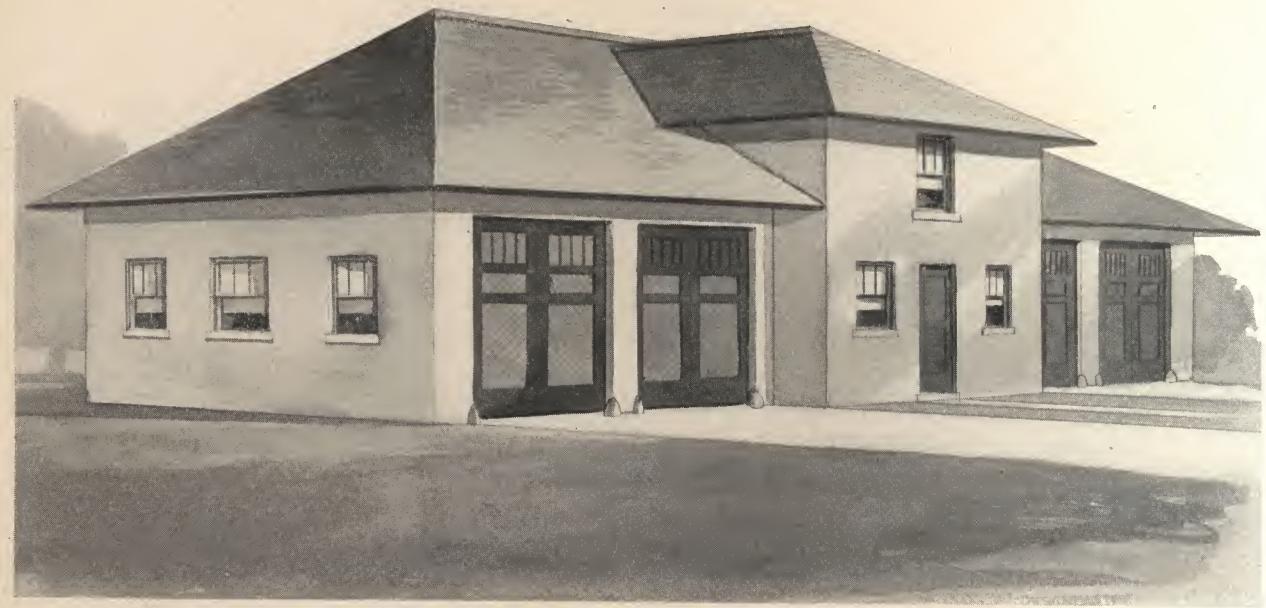
Barn before Conversion into Garage.



Final Appearance of Structure.

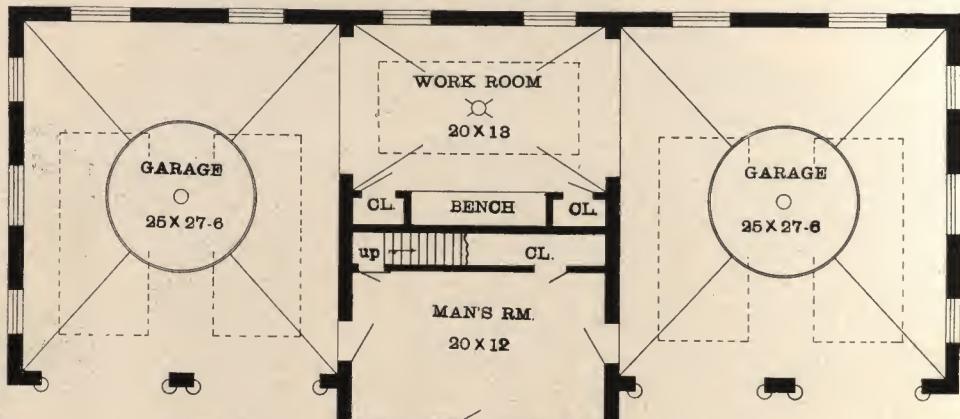
VIEWS ILLUSTRATING TRANSFORMATION OF AN OLD WOOD-FLOOR BARN
INTO AN UP-TO-DATE GARAGE.

For details of construction see opposite page.



Design No. G-121

SIZE: Width, 75 feet; Length, 34 feet.



Floor Plan

PRICE

of Blue Prints, together with a complete set of type-written specifications,

ONLY

\$30.00

We mail plans and specifications the same day order is received.

Unique design in bungalow effect for brick garage for large private estate. In the center is located the man's room and the work room and on either side the garage proper, provision being made for the accommodation of two machines on each side. The attic in the center can be used for storage purposes. Estimated cost of construction from about \$2,600.00 to about \$2,750.00.

Blue Prints consist of floor plan; front, rear, two side elevations; wall sections and all necessary details. Specifications are typewritten and contain all the information necessary for the proper construction of the building.

Garage Construction

COMMON SENSE should prevail in the construction of garages, just as truly as in any other line of intelligently directed activity. And yet we know of instances where a stable costing \$2,000 or upward is used to house a one-hundred-dollar horse, while a \$5,000 automobile is committed to the protection—or rather the counterfeit pretense of protection—afforded by a flimsy wooden shack that offers no obstruction to vandalism or the ever-present danger of a catastrophe of fire.

On account of the necessity of storing gasoline, oil, and other combustible materials, a garage—especially if built entirely of wood—is peculiarly exposed to the dangers of fire either as a result of carelessness on the part of the chauffeur or other help in the storing of materials, the handling of lights, tools, etc.; from spontaneous combustion; or, as often happens, from the spread of fire from outside conflagrations. Special precaution should therefore be taken to provide against the danger by adopting a material and type of construction that will reduce the risk to a minimum. The increase of safety is a consideration that will far more than offset the small excess of cost in a substantially fireproof structure as compared with the ordinary flimsy shed that is liable to burn at any moment.

Automobile owners are beginning to realize this, and are demanding that all the conditions of safety as well as economy and convenience shall be met in the plans from which their garages are built. In all the designs illustrated in these pages, this fact has been kept constantly in mind.

WOODEN FRAME GARAGES—On account of its tendency to absorption of water, oils, and other liquids, and its nat-

urally inflammable character, the use of wood for garage construction is not to be recommended unless special precautions in the shape of protective coverings are taken to minimize the fire risk. An oil-soaked floor will quickly rot rubber tires; and, moreover, the increasingly high cost of lumber and of the skilled labor necessary for good, substantial construction, as well as the constantly recurring costs of maintenance and repairs, renders this form of construction expensive in the long run as compared with the use of other and more efficient materials, such as cement stucco or monolithic or block concrete.

MASONRY GARAGES—A very substantial garage, either large or small, can be built of brick or stone masonry; and these materials offer a wide range of opportunity for following out color schemes and other details of artistic embellishment. They also, of course, can easily be made to meet all the requirements of fireproof construction. As a general rule, however, they are comparatively expensive—especially stone masonry; and outside of the question of harmonizing with other structures already occupying a place in their surrounding environment, they offer no special advantages that are not available at lower cost through the use of concrete in some form or other.

CONCRETE GARAGES—On the whole, the most satisfactory fireproof building material for garage construction, is found in Portland cement concrete. Its advantages are based on its marvelous strength and durability; its absolutely fireproof character; its adaptability to all sorts of structural conditions and combinations; its simplicity combined with dignity and stability of appearance; its ease of harmonious adjustment to varying environment, lend-

ing itself readily to all schemes of ornamentation; the facility with which it can be kept clean; and—last, but not least—its relative cheapness.

There are several ways of using concrete in garage construction, each of which will give good results, the preferable method to use being determined largely by local conditions, such as the supply of skilled or unskilled labor and the quality of material most readily available. Simple one-story garages can be constructed without difficulty under the direction of a good foreman; but for the more elaborate buildings and those of more than one story, the skill of the architect or engineer thoroughly familiar with concrete construction should be enlisted. This is especially essential when reinforced concrete floors are to be built.

In the construction of concrete garages there are five ways in which concrete can be satisfactorily used. In some instances, two or more of these methods have been combined in the same structure. The five methods are indicated by the following headings:

- (1) Plain Mass Concrete.
- (2) Reinforced Concrete.
- (3) Concrete Block Work.
- (4) Concrete Hollow Tile.
- (5) Stucco Work.

In the case of stucco work, the cement mortar is plastered directly on wire lath or expanded metal, which is stretched over the supporting frame, the latter consisting either of wooden stud framework or of a built-up framework composed of iron pipe with threaded ends and connections.

GENERAL WORKING RULES—It is as true in concrete work as in any other form of construction, that to insure a first-class job, the materials that are to be used should be selected with great care. They should also be carefully proportioned so as to give great density and strength to the concrete, and should be very thoroughly

mixed, and properly placed.

The reader will find in Volume V of "Radford's Cyclopedic of Construction," fully detailed instructions as to the selection and proportioning of cement and aggregates (sand and gravel or crushed stone) for concreting purposes, and as to the proper methods of mixing and depositing concrete. These instructions are written in the simplest and plainest English, and summed up in practical working rules and tables, absolutely free from technical terms or mathematical formulæ, and yet giving all the practical instruction necessary for meeting any of the problems that can arise in this connection.

The following brief rules should be constantly borne in mind in making the concrete:

- (a) Use clean, coarse sand; broken stone, or clean, screened gravel; and a standard quality of Portland cement.
- (b) Make sure that the concrete is thoroughly mixed, to insure a perfect coating of the aggregates with the cement paste, and a thorough elimination of voids or air-spaces in the mixture.
- (c) See that sufficient water is added to produce a mushy mixture, to prevent the imprisonment of air-bubbles and insure a compact mixture.
- (d) See that the concrete is used before it gets its initial set—that is, inside of 20 to 30 minutes after the cement has first been wet.

The selection of the aggregates (sand and broken stone or gravel) will play an important part in the appearance of the finished work; and where a particular shade or color is desired, it is recommended that a sample batch of concrete be made, using exactly the material that is to be used in the work.

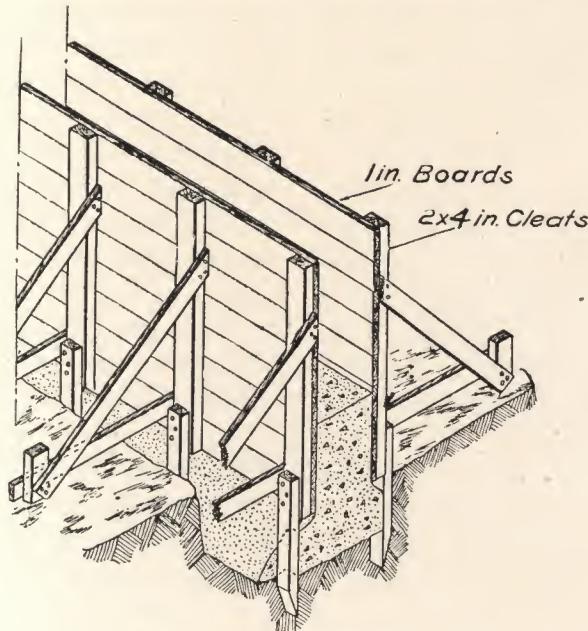
MASS OR REINFORCED CONCRETE CONSTRUCTION—Mass concrete — by which is meant solid concrete, built in place

between temporary wooden forms—is a most durable and substantial type. Floors may be built of the same material, but must be properly reinforced with steel.

First excavate a trench for the wall footing, some depth below the frost line and six inches wider than the proposed wall, and fill to within eight inches of the ground level with concrete—1 part Portland cement, 3 parts clean, coarse sand, and 6

and thawing all material should be heated, including the cement and the water, to fully 80 degrees F., and as soon as deposited must be covered and kept warm until thoroughly set. In hot weather, concrete should be kept covered, sheltered from the sun as much as possible, and continually wet down. You cannot give concrete too much water after it has set.

For a one-story garage the walls need



Forms for Mass Concrete.

parts broken stone or gravel. After the concrete is sufficiently hard to withstand the weight, build the forms for the proposed wall on the center of the footing, and fill with concrete—1 part Portland cement, 2 parts clean, coarse sand, and 4 parts broken stone or gravel—using a stable or coal fork to work the large pieces of aggregate away from the surface, letting the mortar and fine material through, so as to make a dense smooth, hard surface. The forms for the walls may be taken off in 48 hours in warm weather, but should remain longer if the weather is cool. In cold weather concrete may be handled with excellent results, but to prevent injury from alternate freezing

not be over eight inches thick. For a two-story building, make the first story ten inches thick and the second story eight inches thick. After the forms are in place it is desirable to smear their inner surface with petroleum (crude vaseline), soft soap or other similar material, to prevent the concrete adhering to the forms and being disfigured when the latter are removed. After the forms are taken down, and before the surface of the concrete has dried out, the board marks should be removed by rubbing the surface with carborundum brick and washing down with clean water. This method is superior to applying a wash of any kind. A piece of hard sandstone will

do for this rubbing, but the carborundum will work faster and cut cleaner.

For mouldings, panels, projections or recesses, corresponding moulds should be made in wood and set up rigidly with the wooden form work, and filled simultaneously with the rest of the walls.

It is best to fill entire sections of the wall in one operation, stopping only at a moulding or other horizontal line, as it is difficult to bond concrete masses when the earlier masses have already set, and the line of cleavage between masses of concrete deposited at different times is likely to show permanently.

If a wall is to be stuccoed it would be desirable to reduce the quantity of sand and allow more or less honeycombing to appear on the surface of the work, to give an additional bond to the mortar. It is also desirable to wait a month or so after the concrete has been poured before applying stucco to a concrete wall.

In the application of reinforced concrete to garage construction it is customary to confine the reinforcement to a skeleton frame, as it were, of reinforced concrete, with uprights sixteen to eighteen feet apart, and the panels between the uprights filled in with solid mass concrete or with concrete blocks or tile. The use of blocks or tile gives a very attractive building, which has also the advantage of greater economy than the solid construction.

Where special decorative effects are desired, much can be done by using a facing consisting of a fine mixture of light-colored cement and variously colored sand and aggregates, such as crushed granite, or marble, or variously tinted pebbles. After the concrete has reached a proper hardness, the face of the work may be tooled, so as to bring out the texture of the facing mixture, stonemason's tools being used for this purpose. If the colored aggregates do not contain limestone, a wash of dilute

acid may be given to clean off the cement from the surface of the aggregates and emphasize the color scheme. This may be done any time after removal of the forms, and should be followed with an alkaline wash to neutralize the free acid and prevent the etching process being carried too far. Finally the surface should be thoroughly washed with water.

Colored mineral pigments are also used in decorative schemes, and ornamentation is also secured by the insertion of mosaic work of colored stones, or of terra-cotta, or colored tile.

For the overhead covering the most economical construction that conforms to the requirements of safety will be a wooden roof covered with tiling, slate, or asbestos, and sealed on the under side with a ceiling of cement mortar laid one-half inch thick on expanded metal or wire mesh securely wired or stapled to the supporting rafters or joists.

CONCRETE HOLLOW TILE CONSTRUCTION—A form of wall construction that has been found economical and satisfactory in some parts of the country consists in the use of concrete hollow tile. These are obtainable in various shapes and sizes and can be laid up rapidly and efficiently by any brickmason. In the body of the wall they should, of course, be laid breaking joints, and so as to give a series of practically continuous air spaces.

A footing should be laid, extending three inches on each side of the proposed wall and from eight inches to ten inches in thickness. This footing should be carried below the frost line, as in mass construction. The tiles, which are to be had, usually, ten inches wide and eight inches high, should be laid on top of this footing and carried up to ground level or above. If the load is not too heavy, the smaller tile—6 by 8 inches—may be laid up for the rest of the wall. In the corner tile the cells run ver-

tically instead of horizontally, and these tile may be used in combination with the regular wall tile for the purpose of turning corners and working around doors and window jambs.

If a two-story building is required, it is advisable to fill the corner tiles with concrete and reinforce the piers thus formed with steel bars. It will also be found advisable to carry the 8 by 10-inch tile up to the level of the under side of the beams and use the smaller tile for the second story.

With concrete hollow tile a wide variation in methods of construction is possible. In floor construction an excellent fireproof floor can be obtained by using corner tile for the floor fillers, with poured ribs of solid concrete between.

For the exterior finish of a concrete hollow tile wall, stucco can be employed to advantage. It will adhere readily, provided the wall is thoroughly wet when the stucco is applied. As the stucco has the same constituents and the same coefficient of expansion as the tile, little difficulty will be experienced from its cracking as the result of expansion and contraction due to variations of temperature under the action of the weather. This trouble is frequently experienced where stucco is applied over terra-cotta tile.

CONCRETE BLOCK CONSTRUCTION—Concrete blocks have the advantage of being obtainable almost anywhere, and they will do excellent and economical service, *provided they are well made*. This condition is an absolute essential to their successful or satisfactory use, since if the mixture of ingredients is not well proportioned and thoroughly compacted, so as to give a practically waterproof block, they will not only be deficient in strength, but are apt to show a constant tendency to absorption of moisture, with the consequent inconveniences and dangers of damp walls.

If, on the other hand, the blocks are properly made and laid up, they afford a perfectly satisfactory wall, and the liability to the troubles above referred to becomes a negligible quantity.

Concrete blocks are generally made with rock face or finished surfaces, and consequently do not necessarily require any surface treatment or stucco.

There are many types of blocks on the market, such as one-piece solid and hollow blocks, and two-piece blocks. The solid blocks usually call for furring and lathing on the inside; but the hollow and two-piece blocks, if properly made, obviate this necessity by the provision of air-spaces. Other things being equal, a wall made of two pieces will naturally tend to be superior to a wall made of one piece, as the one-piece blocks, unless made from a wet mixture, are not likely to be so water-tight as the two-piece type, and the wall is consequently more likely to be damp if made of one-piece blocks. By using a facing material of a very rich mixture, however, and a rich, dense mixture throughout, very good weatherproof blocks can be made. Sills and lintels may be cast in wooden forms to fit window and door openings.

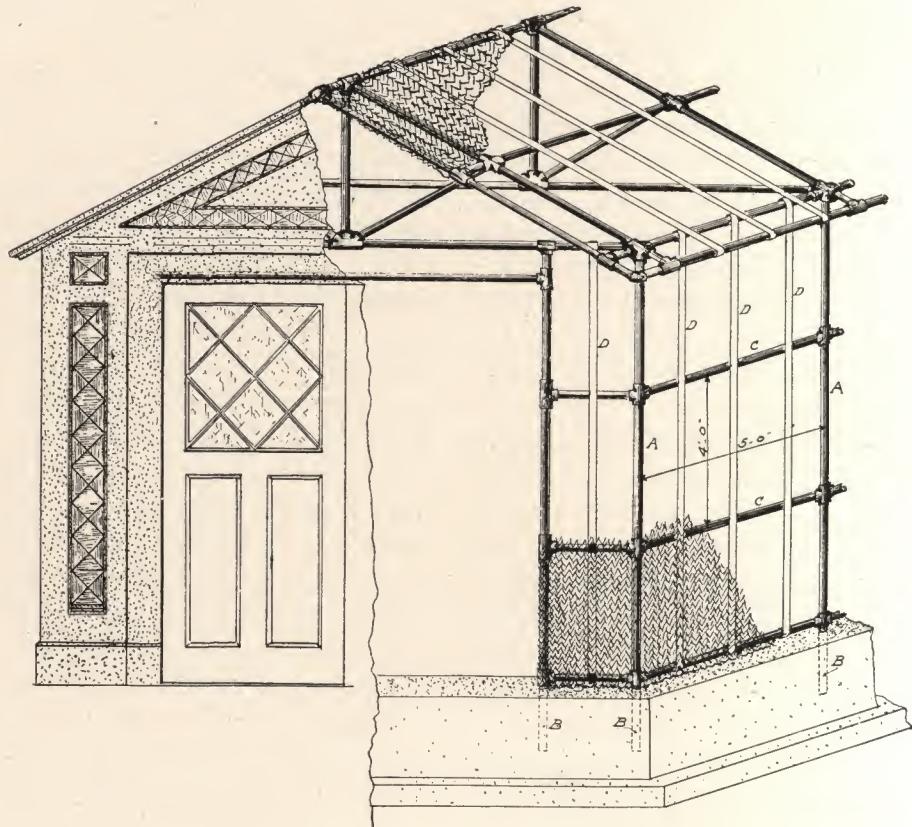
Concrete blocks should be laid as cut stone, and any good foreman is competent to superintend the work. If desired, a stucco exterior finish may be applied, in the same manner as in the case of hollow concrete tile.

STUCCO ON IRON PIPE FRAME WORK—In localities where material for making concrete is scarce, and where an owner finds an object in avoiding the expense of solid concrete construction, an economical and very efficient form of construction is found in the use of Portland cement stucco on wire mesh or expanded metal stretched over and securely stapled or wired to a supporting framework of wood studding or iron pipe. The stapling

should not hold the metal lathing absolutely rigid, but should allow of a little play to counteract the effects of expansion and contraction and prevent the formation of cracks.

The use of iron pipe gives a frame the

wall itself should be twelve inches thick, built between suitable plank forms. Mix the concrete for the wall and footing in the proportion of 1 part good Portland cement, 2 parts clean, coarse sand, and 5 parts gravel or broken stone. Use sufficient



Courtesy of Atlas Portland Cement Company

Diagram of Pipe Frame Garage

materials for which can readily be had and which is simply put together. The framework is set in a base of concrete.

The method is simple and at the same time is applicable to variation and decoration so as to meet all practical requirements and make an artistic structure.

FOOTING WALLS — Excavate and build a footing wall from the surface of the ground to below the frost line. Provide a footing under the wall six inches thick, extending three inches on either side. The

water to make a soft concrete, and puddle into place until forms are thoroughly filled, flush to the top.

Before the concrete has set, imbed, along the center line of the wall, pipe dowels eight inches long, threaded to receive the standards AA, as shown in the accompanying drawing. If angles are used in place of piping, the dowels should be large enough to let the angles down inside so that cement mortar made of 1 part good Portland cement to 2 parts of sand may be

poured down into the dowels to hold the angles rigidly in place.

The details of the frame, should, of course, be laid out carefully in the working drawings, and all dimensions determined. The local gasfitter or blacksmith can then get out main structural parts and assemble them, only light tools being necessary in either case. For a pipe frame, use 2½-inch galvanized uprights, spaced not more than 5 feet on centers, and 1½-inch galvanized horizontals about 4 feet apart. The frame, having been set up, fasten on the studs DD of ¾-inch by ¼-inch flat iron bent around the horizontal pipe and stretched well into place. The studs should not be more than 16 inches on centers.

Metal lath should be laced to the studs DD, tied on well with No. 16 wire. There are a number of kinds of lath on the market, some of which are ribbed and provided with clips or fasteners to take the place of wiring. Any of these will do, but it is essential that the ratio of opening in the lath be large as compared with the area of metal. Wire mesh, expanded metal, and the like, are best for walls of this kind. Wherever the mortar is to be carried around the pipe frame, as at the edge of the eaves, carry the metal lath well around and wire firmly.

In pipe frame construction, three coats of stucco will be required to make a good wall finishing about 1½ inches thick, two coats being applied outside, and one, a finishing coat, inside, a single layer of metal being used.

Small 1½-inch channel-iron frames, punched with 1¼-inch holes and provided with bolts, should be set around all door and window openings, to receive a wooden buck to which the door or window frame may be fastened. This should be done before stucco is applied.

After the scratch coat (see specifications

for stucco, given below) has been applied to roof, and before second coat is put on, set 2-inch by 1-inch beveled wooden strips running parallel with the eaves, and wire firmly. The spacing will depend on the kind of roofing to be used, whether slate, asbestos, tile, etc. After the strips are set, fill flush on the top with mortar mixed 2½ parts sand to 1 part good Portland cement.

If desired, many elaborate and beautiful effects may be secured by the introduction of panels or borders in tile, mosaic, or even pebbles and field stones. Frames of wood of required outline and thickness should be wired to the lathing and the stucco work finished. After the wall is hard, remove the wooden frames carefully and fill the panels by grouting in the tile or other ornament, as desired.

Small angle-iron may be substituted for the pipe frame, the angle irons being cut to the proper length, riveted together, and set up in the same manner as for the pipe frame. The furring, metal lath, stucco, etc., will be applied in the same manner as described.

STUCCO ON WOOD STUD FRAME—

A still cheaper method of construction consists in the use of a framework of wood, 2 by 4-inch wooden studs 16 inches on centers, with bridging between, being used in place of the pipe or angle-iron frame. Staple the metal lath on to the wooden studs, but have the stapling loose enough to allow a certain amount of play between the lath and the stud.

Use two coats of stucco on the outside, and apply one coat inside between the 2 by 4-inch studding. A neater appearing interior can be had, and the garage made more fireproof, by lathing and stuccoing the interior in the same manner as the exterior, but in place of making a rough finish the finished coat should be floated smooth.

SPECIFICATIONS FOR STUCCO WORK

The following instructions regarding the methods of making and applying stucco should be carefully followed in the actual work of construction:

Stucco work may be used to cover wood, brick, stone, or any other building material, provided special precautions are taken in preparing the surface properly, so that it will adhere and not crack or scale off. The work should be done by an experienced plasterer.

As a rule two coats are used—the first, a scratch coat, composed of 5 parts Portland cement of standard quality, 12 parts clean, coarse sand, and 3 parts slaked lime putty and a small quantity of hair; the second, a finishing coat, composed of 1 part Portland cement of standard quality, 3 or even 5 parts clean, coarse sand, and 1 part slaked lime paste. Should only one coat be desired, the finishing coat is used. Some masons prefer a mortar in which no lime is used, but this requires more time to apply.

To apply stucco to brick or stone or concrete, clean the surface of the wall thoroughly, using plenty of clean water, so as to soak the wall. If the surface is concrete, roughen it by picking with a stone ax. Plaster with a $1\frac{1}{2}$ -inch coat and finish the surface with a wood float; or, to make a rough surface, cover the float with burlap. Protect the stucco work from the sun and keep it thoroughly wet for three or four days; the longer it is kept wet the better.

In using stucco on a frame structure, first cover surface with two thicknesses of roofing paper. Next put on furring strips about one foot apart, and on these fasten wire lathing. Apply the scratch coat $\frac{1}{2}$ inch thick, and press it partly through the openings in the lath, roughing the surface with a stick or trowel. Allow this to set well and apply the finishing coat $\frac{1}{2}$ inch to 1 inch thick. This coat can be put on and

smoothed with a wooden float, or it can be thrown on with a trowel or large, stiff-fibered brush, if a spatter-dash finish is desired. A pebble-dash finish may be obtained with a final coat of 1 part good Portland cement, 3 parts clean, coarse sand, and pebbles not over $\frac{1}{4}$ inch in diameter, thrown on with a trowel.

DRAINAGE AND FOUNDATIONS

The kind of foundation which may be used for any particular building depends partly upon the nature of the building, and also partly upon the character of the soil or the site upon which it is built.

We might classify soils as wet or porous and dry or solid; but in this case we shall divide the sites into two classes—those which can well be drained and those which cannot.

For even though the soil be firm and dry, we should not expect to erect much of a building, especially a garage, without making some provision for draining away the water which may be expected to be present at times. And, on the other hand, we may have to deal with a wet, porous soil and a site where there is a quantity of water; yet it may be that by well-arranged drains this can be made an excellent building site.

In draining a building site the main points are to get the drains sufficiently deep, have enough of them, and have them connected to an outlet of ample size and with a good fall.

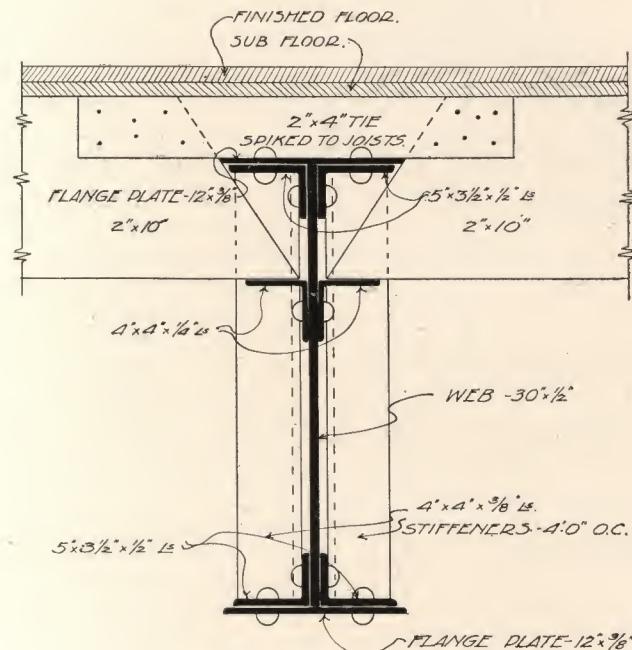
When we attempt to lay down a floor on soil which is wet, or on sites where, for any reason, drainage is impracticable, we must plan to make the construction waterproof. This is not a difficult matter, provided we are not unduly scrimping as to the expenses.

A few inches, more or less, of good concrete, with which some waterproofing is combined, is generally sufficient. Then, in some cases, asphalt and felt are used.

In the case of ordinary outbuildings, small barns, etc., very little attention is usually given this matter of foundations and waterproofing. It is common practice to place them on a few abutments or piers, or to lay a low, dry wall. This will do in some cases for the garage, on a dry soil; but where the soil is porous and spongy it becomes a problem how to secure a good foundation at a reasonable expense. Perhaps as good a way as any is to excavate

and build concrete piers which shall extend below the main wall. These piers should be reinforced vertically and may be made thicker than the rest of the wall.

For small, light buildings, good foundations have been secured by digging a trench a foot or more deep and of the same width, and at the corners and at other points in the trench, say each side of the door openings, a hole is bored down with a post auger to a depth of ten feet below the trench.



Steel-Girder Floor Construction
for Lodge Hall

a trench of good width and depth, proportionate to the size and weight of the building, and build a good concrete wall.

This wall should be reinforced, both for strength and for economy. One horizontal rod on each face for each foot in height will generally be about right.

It is well to excavate somewhat deeper at each corner and at intermediate points,

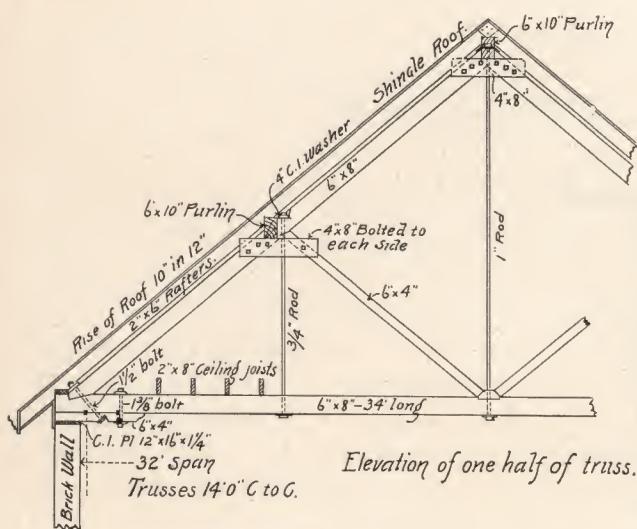
Cedar posts are driven into these holes and cut off at the proper height to receive the sill. Forms are then set upon each side of the trench a foot high, and the trench, the holes around the posts, and the forms filled with concrete. The sills are spiked to the posts, which are set so as to be a few inches from the face of the wall. Such a foundation will prove very satisfactory.

TRUSSES FOR GARAGE ROOFS

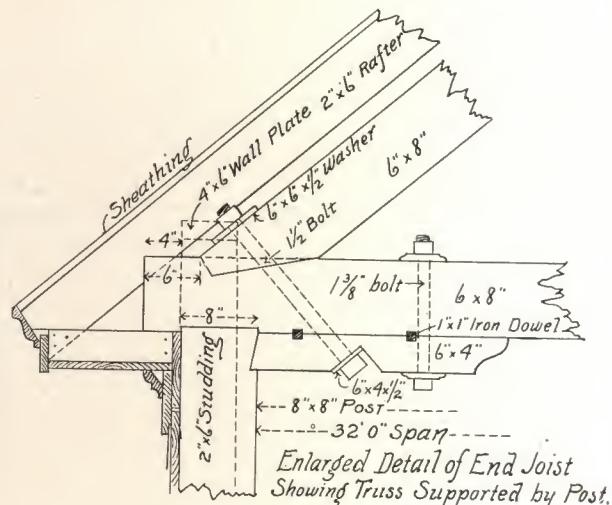
The garage should be so designed and constructed as to have a perfectly free and unobstructed space on the ground floor. Posts would be very much in the way. This applies particularly to the larger garages, where a number of cars are kept. With these it becomes quite a problem how to design the roof of wide span

construction of a steel plate girder of sufficient size to furnish the required strength and stiffness in this case. These were placed 12 feet on centers and carried on cast-iron plates built into the brick wall, the walls having a pilaster built under each end of the girder.

Although it is rarely safe to build a building of this character without provid-



Light Truss for 32-foot Span.



Good Joint for Heavy Timber Truss.

so that it can be supported entirely at the side walls. Also, if there are living rooms above, or lodge rooms, as in some public garages, the problem of supporting this additional weight without center posts becomes rather serious.

One such building recently constructed is 40 feet wide and 60 feet long. The lower story is used for a garage and the second story for a lodge room. This floor will sometimes be used for dancing, and so it was necessary to have the construction very rigid.

The accompanying figure shows the con-

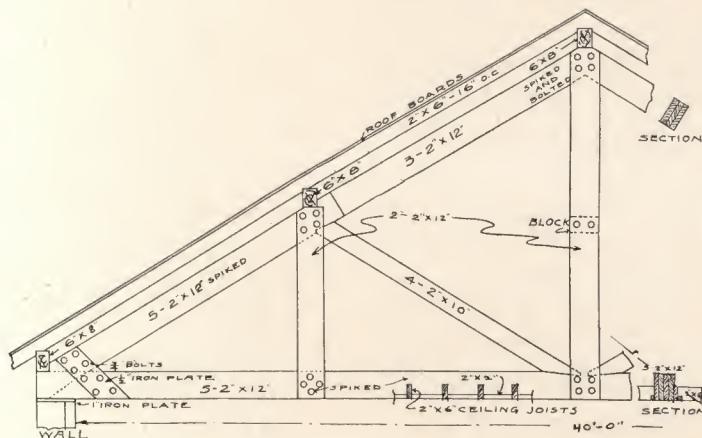
ing one's self first with complete plans, prepared by a thoroughly competent architect, still a few suggestions relative to light truss construction and a few typical truss designs may prove helpful.

For a trussed roof of medium span, say 32 feet, having a pitch or rise of 10 inches in 12, the dimensions given in the accompanying sketch are to be recommended: For either a slate or shingle roof, a pitch or rise of 10 inches in 12 is both economical and pleasing in appearance. A steeper pitch is not objectionable, except that it increases the length of rafters and conse-

quently the cost. These dimensions are about as small as should be used for trusses spaced fourteen feet on centers, and supporting a plastered ceiling. If there is no ceiling, and nothing to be supported but

probably answer, but it should be reinforced under the trusses by a four by twenty-one-inch pilaster.

PLANK-FRAMED TRUSS—A plank-framed truss is very popular where an in-



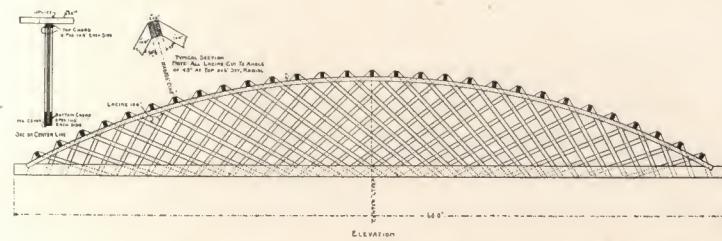
Inexpensive Plank-Framed Truss

the roof, the truss rafters and tie-beam may be made six by six, and the rods reduced to five-eighths and seven-eighths inches. The tie-beam should be in one piece thirty-four feet long.

Another of the illustrations shows a de-

expensive truss is wanted for a medium span.

The accompanying diagram shows a built-up roof-truss of satisfactory, and at the same time of cheap construction for such a purpose. Wind and snow load on a



Cheap Lattice Truss for Broad Span.

tail for support on posts. If supported by a brick wall, the construction will be slightly modified as shown in the former instance. If the garage is one or two stories in height, a twelve-inch wall will

roof of this kind is a factor that has to be considered. This truss will prove amply safe for a 40-foot span. They should be set in 16-foot bents. The expensive large dimension timbers are not used, the dif-

ferent members being built up of 2 by 10-inch and 2 by 12-inch pieces, spiked together to break joints as specified on the drawing.

A LATTICE TRUSS—A cheap truss for broad spans is the lattice truss, built up out of light timbers, which can be had in any lumber yard. It is easily constructed. Such a truss for 60-foot span, is shown in one of the illustrations herewith. These trusses are to be placed 10 or 12 feet apart with 2 by 6-inch rafters placed on the curve, as shown. The roof boards are nailed to these rafters, and can be covered with almost any roofing material. It is taken for granted, of course, that the joints in this, as well as in any form of truss, should be tight, with perfect bearing at all parts, and well nailed.

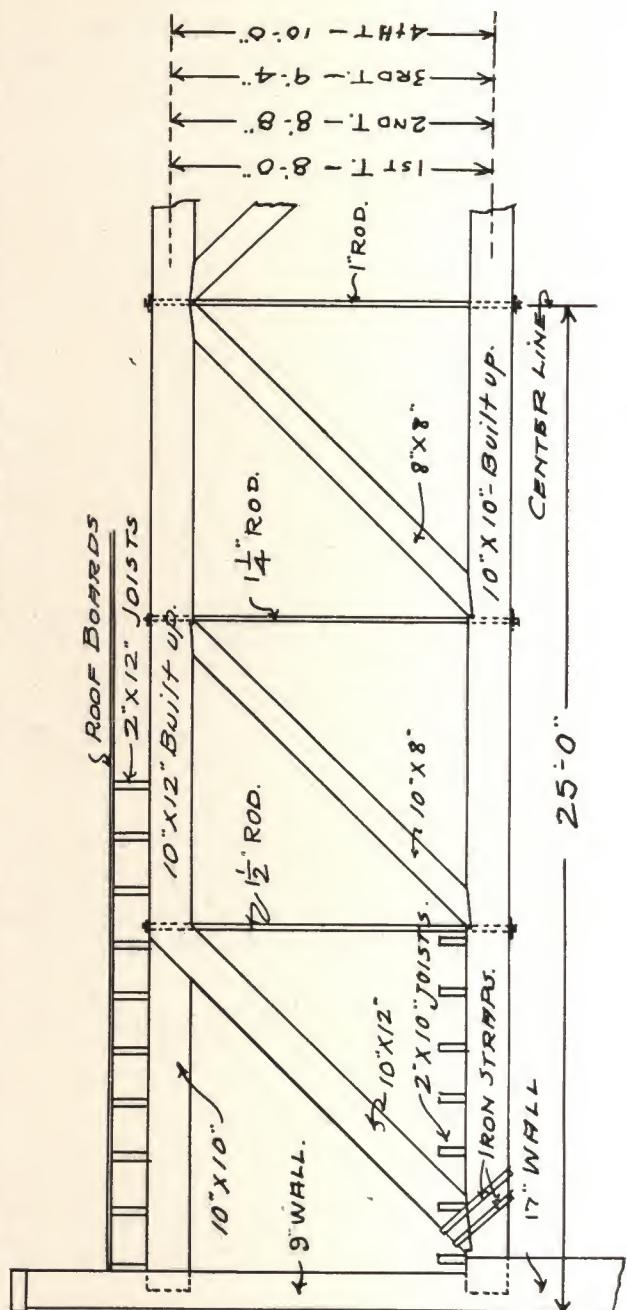
Such a truss as this acts itself as a tie, requiring no rods to keep the walls from spreading. The same principle may be used equally well for narrower spans.

TRUSS FOR FLAT ROOF—Still another of the cuts shown herewith illustrates the first of a series of trusses for a flat roof. These are to be placed 14 feet apart, increasing in height toward the front of the building to give proper slope to the roof.

GARAGE FLOORS OF CONCRETE—The details of floor construction for garages are practically the same as for the construction of sidewalks—a footing or sub-base of lean concrete, a base of medium concrete, and a top or finish surface of very rich concrete floated smooth.

The reader will find in Radford's Cyclopedie of Construction (Vol. VI, pp. 160-175) full and explicit instruction covering every necessary detail of sidewalk construction. We reproduce here some of the more important features.

CEMENT—In all sidewalk work, Portland cement is used. In small jobs it is only necessary to secure cement from a reputable manufacturer; but where the quan-



Truss for Flat Roof

tit of work will justify, it is advisable to have the cement tested. The standard methods for testing, adopted by the American Society of Civil Engineers, should be used, and the cement should comply with the Standard Specifications for Cement of

the American Society for Testing Materials. These testing methods and specifications will be found in Volume V of Radford's Cyclopedic of Construction.

AGGREGATES—The first requisite in the selection of the stone for the concrete is **cleanliness**. This is absolutely essential to strength in the concrete. In selecting an aggregate, the character of the surfaces presented by the particles should always receive close attention; these must be hard and permanent. A covering of any fine material will interfere with the cement or mortar getting into contact with the surface of the aggregate, and the strength will be reduced proportionately. An excellent precaution in this respect is to **avoid the use of dirty materials**.

Some experimenters found that certain sands gave better strength with the addition of 10 or 15 per cent of finely divided clay than when tested without the clay. This, however, is no argument in favor of dirty materials. The addition of a small percentage of finely divided clay might be permissible when the clay is treated as a separate material, while even a much smaller quantity naturally occurring in the aggregate might make it wholly unfit for concrete purposes.

In order to obtain the best results, the **aggregates should be well graded**; that is, they must not contain an excess of one-size particles, and must contain but a small percentage of fine particles. In the case of stone, the material will usually be quite satisfactory, provided the stone in itself is hard and durable and not affected by exposure to the elements, and provided it is prepared and marketed under conditions which assure its being clean and free from a covering of dust or other matter.

Some stone, though apparently quite hard, presents a chalky surface with which it is impossible for the cement to form a

perfect bond. Stone of this character should be avoided, for it cannot possibly produce good concrete.

In sand and gravel, one is dealing with entirely different materials, but materials probably to be preferred to stone and screenings, when selected with sufficient care. The use of sand and gravel is very popular, owing to the ease with which they are obtained in many localities. Where these materials are readily secured, they are frequently used as they come from the deposit, with little or no thought given to their fitness for the work in hand. The character of the materials which are sometimes used in concrete is surprising. Aggregates should always be firm and hard, and should remain so when exposed indefinitely to the weather. It is quite common to find a considerable quantity of shaly pebbles in some of the glacial sands and gravels of the upper Mississippi Valley. These pebbles are not strong in the first place; and they disintegrate readily when exposed to the elements. They also absorb water readily when used in concrete, and expand under the combined action of moisture and frost, injuring the concrete to a greater or less extent. Though the effect of the soft sand grains is not so apparent as is the effect of the larger pebbles, such sand cannot possibly produce first-class results if the shaly particles form any considerable portion of the sand content. In the territory referred to, it is not unusual to find sidewalks badly pitted and marred, as a result of the disintegration of this shaly material. These shaly particles are undesirable, because they are both weak and unstable. **A concrete can never be stronger than the material making up the aggregate.**

The size of the sand grains and the relative proportion of grains of different size, have a very marked effect on the value of

the sand. At least 75 per cent of a sand should be retained on a 40-mesh sieve, with the particles well distributed between that size and the size passing a 4-inch sieve, with an increasing proportion on the coarser sieves. Such a sand will have much less total surface than one composed of equal proportions of particles on the several sieves. A sand made up entirely of fine particles will present a very much larger surface which must be covered with

used for the concrete in the proportion of one part cement to four parts aggregate.

The general quality of this material was fairly good, though it will be noted that only 2 per cent of it could be considered gravel. No particles found in the sample were larger than $\frac{1}{2}$ inch. The computed voids in the sand were 33 per cent; measured by displacement, 29 per cent. The mixture of 1 cement to 4 sand, therefore, was out of balance, the cement not being suffi-

Sand Analysis

WEIGHT OF SAMPLE—500 GRAMS											Measured and Computed Voids	Specific Gravity	
Percentage Retained on Sieve No.										Through No.	Measured	Computed	
4	10	20	30	40	50	80	100	200	200				
2.0	15.6	14.8	17.8	11.2	5.4	27.6	2.2	3.8	1.0%	29.2	33.2	2.614	

cement, than either of the sands above mentioned. For instance, the total superficial surface of a given volume of spheres one-sixty-fourth inch in diameter is sixteen times the surface of the same volume of spheres one-fourth inch in diameter. As the making of a first-class concrete necessitates the perfect covering of every particle of sand with cement, and every particle of the coarser aggregate with the cement-sand mortar, it is apparent that materials with an excess of fine particles should be avoided. The same line of reasoning is applicable to the combined aggregate in the concrete.

Occasionally one sees a mixture of cement and sand used for the concrete base in sidewalk construction, and cannot help being impressed with the fact that the user fails to appreciate the requisite of a good concrete.

In the accompanying table will be found a physical analysis of a material taken from a sidewalk job, in which it was being

cient to fill the voids. Not only did this volume of sand contain more voids than the cement could fill, but the excess of fine material detracted from the value of the sand as it was being used, because it presented a very much larger surface than the cement could possibly cover.

Size of Aggregate. Aggregates exceeding $1\frac{1}{4}$ inches in diameter should not be used. Undoubtedly there are many gravels which would give good results, though containing larger sizes; but this limit is safe and the one most often applied to this class of work. The lower limit, $\frac{1}{4}$ inch, which is also the upper limit for sand and stone screenings, is almost universally accepted.

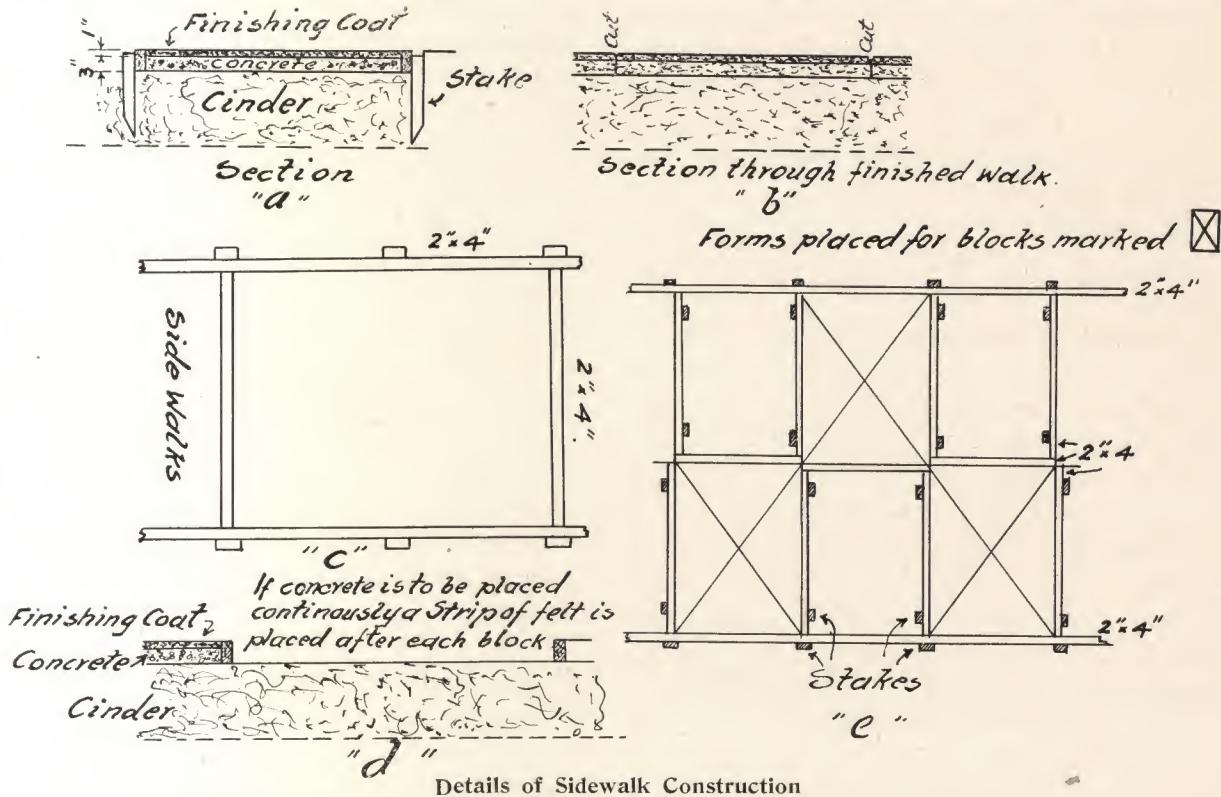
Unscreened Gravel. In many districts, unscreened gravel (gravel as it comes from the bank containing both coarse and fine particles) is used. This practice should be avoided, as such material usually contains a large excess of sand, and would be much improved if screened and the proper

proportions of fine and coarse particles remixed. The increased value of the remixed aggregate over the natural material would more than justify the additional expense. The case referred to in the table illustrates this point quite clearly.

FOUNDATION OR SUB-BASE—The foundation must provide a permanent bed for the walk, and serve as a means for disposing of water which would otherwise accumulate under the walk. In many lo-

the available outlets, etc. In some cases stone-filled trenches, properly placed at intervals along the walk, will provide adequate drainage, while in other cases a tile drain will be necessary.

Material. The material to be used for the foundation or sub-base of a walk will depend to a great extent upon the locality in which the work is contemplated. The builder can best determine from the materials available which one is the most



calities, a well-constructed sub-base will offer sufficient drainage; but in some soils and under some conditions additional drainage is necessary.

Drainage. If water is allowed to accumulate in the sub-base, there is danger of the walk being heaved by frost. Therefore, in soil where the sub-base and the natural drainage cannot take care of the water, other drainage should be provided. The best means of supplying this additional drainage will depend somewhat upon

satisfactory and economical. The one chosen must be of such a character as to withstand the tamping, without crushing to the extent that it will prevent proper drainage. **Steam cinders** are commonly used for the sub-base; and if the fine material is eliminated, they afford a solid foundation and provide excellent drainage.

FORMS—In general, wood will be used for the forms, though thin strips of metal will be found convenient in forming curved lines. Also, the use of a metal cross-form

or parting strip will be a guarantee against defects arising from imperfect joints or expansion. The cross-form should be made of $\frac{1}{8}$ -inch metal, with stiffeners of the same thickness on the ends and top. Wedges are to be driven from the outside into the $\frac{1}{2}$ -inch clearance space between the wooden side forms and the metal cross-form. Ready-made parting strips of special patented type are now on the market.

The wooden forms should be constructed of clean lumber free from warp, and at least 2 inches thick by about 5 inches wide. Surfaced lumber has advantages, but its use is not necessary.

In placing the side forms along the line of the walk, care should be taken to maintain a good alignment, and they should be leveled so as to conform with the finished grade.

Providing for Surface Drainage of Walk. The form nearest the street should be slightly below the inside form, thus providing a drain which will prevent water from collecting on the walk. The side forms should be securely staked, the stakes alternating on either side about every two feet. If the special metal cross-form is used, fewer stakes will answer, for when the form is keyed into position, it is rigidly fastened and holds the outside forms in their proper relative position. Wooden cross-forms need only be held in place by stakes on the opposite side from which the concrete is to be deposited. When the concrete is being placed, a shovelful or two will hold the cross-forms firmly until it is tamped into position.

When wooden cross-forms are used, the location of the joints should be definitely determined and plainly marked on the side forms before any concrete is placed. The cross-forms should be placed so that the face against which the concrete is to be packed is in line with the points indicating the position of the joints.

Providing for Expansion Joints. About every 50 feet one of the wooden cross-forms should be replaced by a metal parting strip, which should be left in the walk until it is opened to traffic, when it will be removed, and the opening thus produced filled with paver's pitch or other suitable material. This forms an expansion joint, which insures the walk against cracking. This precaution is also necessary when a new walk abuts curbing or other cement or stone walk.

SURFACE TREATMENT—The surface treatment which a walk receives depends largely upon the practice in the community in which the work is being done. The smooth, **steel-trowel finish** is probably the most common and at the same time the poorest finish used. Such a finish frequently results in crazing or hair-checking of the surface, which is due to nothing more than a slight contraction which takes place in the film formed on the surface by the steel trowel. Besides the smooth finish showing every little blemish and variation in color, it is much more slippery than any of the other finishes.

The **wooden-trowel finish** is growing in popularity, and certainly has many points in its favor. The **brush finish** is similar to the wooden-trowel finish, but it requires an additional tool, and one that can be used for no other purpose. The finishes that are produced by special tools, like the tooth-roller, etc., have little to commend them. They are in no way superior to the rough finish produced in a simpler manner, and do not harmonize so well with the usual surroundings.

Marking. There might possibly be some chance for argument regarding surface finish, but certainly surface marking will not permit of any. The position of the joints between the blocks should be determined before the base is placed, and provided for in the construction. **Positive joints should**

always be provided in the base of the walk. These are the real joints, and the markings in the top should always occur over them. It is not sufficient to make a surface marking, together with a feeble effort toward cutting through the base with a small trowel or similar instrument. **More walks** are disfigured by failure on the part of the builder to provide proper joints than by any other cause.

Size of Block. The size and shape of the blocks into which a walk is divided are governed very largely by the width of the

necessary angles; in fact, so far as possible, all blocks should be rectangular. Also the joints in new work, abutting old, should always be projected from the joints in the original work, unless a distinct open joint is provided between the new and the old.

YIELD OF ONE BARREL OF PORTLAND CEMENT—A barrel of Portland cement should contain 380 pounds net, or three and one-half cubic feet. One operator states that if work is well tamped, a barrel will yield the following:

	Cement	Sand	Gravel	Thickness	Per Bbl.
Concrete course.....	1	5	6	3 inch 1 inch	
Top course.....	3		.	4 inch walk	52 sq. ft.
Concrete course.....	1	5	6	3½ inch ¾ inch	
Top course.....	3		.	4 inch walk	55 sq. ft.
Concrete course.....	1	5	6	3½ inch 1 inch	
Top course.....	3		.	4½ inch walk	49 sq. ft.
Concrete course.....	1	5	6	4 inch 1 inch	
Top course.....	3		.	5 inch walk	42 sq. ft.
Concrete course.....	1	5	6	4½ inch 1½ inch	
Top course.....	3		.	6 inch walk	31 sq. ft.
Concrete course.....	1	5	6	6½ inch 1½ inch	
Top course.....	3		.	8 inch walk	24 sq. ft.

walk, the local practice, and personal tastes. Other points, however, should be considered; in fact, local practice and personal tastes should be eliminated entirely when walks on business streets are being constructed. Where the whole space between the building line and the curb is to be covered, many angles and irregular lines are introduced, owing to openings, steps, etc. Steps should never be constructed over a joint; nor should a joint ever be permitted to intersect a step (excepting at a joint), unless the walk and step are constructed entirely independent of each other. Joints between the blocks should be placed so as to avoid small corners and un-

CAUSES OF DEFECTS—Frozen concrete surfaces have the appearance of being spotted. A surface frozen before the concrete has set, scales off easily. Paper, tarpaulin, or clean sand can be used to prevent freezing. Good cement work can be done in freezing weather by using warm water, warm sand, and gravel, and protecting the material from freezing.

Sunburned surfaces have the appearance of over-burned clay. Good results can be secured in hot weather by covering with canvas.

Poorly mixed cement surfaces look streaky when set. Dirty streaks are caused also by the use of unclean materials.

By using **too much water** in the top mix, the cement is washed out, and a good **union** between the top and concrete is not obtained. The surface coat is also prevented from adhering by dirt or by weak concrete.

Insufficient tamping makes the work porous and weak. The top surface should be laid before the under concrete is set.

Over-troweling the surface coat causes hair-cracks and work that is slippery, rough, and wavy.

Cracks are caused by poor mixing, by too much tamping, by shocks in the early stages of setting, by poor concrete, by walking on scantling when work is new, by making the blocks too large for the thickness of the work, by roots of trees growing under the walk, or by not cutting work through at joints to allow for expansion.

Pock marks are caused by **improper floating before marking**. **Rain** on the work before the top has set, also causes pock marks.

Sloughing off is caused by insufficient cement, poor mixing, or the use of poor material.

Too much water causes honeycombed and streaky work, and also is apt to prevent a good bond between the top and base. Insufficient water will affect the strength of the concrete.

ASPHALT FLOORS—In some cases, for elaborate and expensive garages, an asphalt floor is used. The following are complete specifications for the proper laying of such a floor as specified by one of the well-known asphaltum companies:

MASTIC AND FLUX—The asphalt mastic to be used shall be that produced by * * *. The asphaltic cement or flux must not be less than 99 per cent pure bitumen, shall be absolutely waterproof and unaffected by extremes of temperature.

PROCESS OF MIXING—Four hundred and eighty (480) pounds of mastic blocks shall be broken up in small pieces, weigh-

ing about two pounds each, thrown into kettle, and, before the fire is started, about 5 per cent of the pure asphaltic cement or flux shall be added, for mix in a room of ordinary temperature, 70 degrees. In rooms of high or lower temperature, percentages of asphaltic cement shall be used according to these temperatures; this mix is then cooked to a temperature of about 400 to 430 degrees F., being brought to this temperature gradually, or until it reaches the proper consistency.

To this mix shall be added about 75 to 85 per cent hot, clean torpedo grit, after first being heated and dried, in such proportion that the desired results may be obtained. The mixture must be stirred until the full amount of grit is incorporated.

PROCESS OF LAYING FLOORS 1½ INCHES THICK—Floors should be laid in two layers, each $\frac{3}{4}$ inch in thickness. This heated mixture shall then be laid evenly in strips of about 8 feet wide (or such widths as to reduce the number of joints), using a strip of wood $\frac{3}{4}$ inch thick by 3 inches wide, laid parallel with the wall, for a guide.

This bottom layer shall not be rubbed smooth, but simply massed evenly. Great care should be taken that no dirt is allowed to accumulate before the second layer is laid over it.

After two strips of the bottom have been laid, a second layer $\frac{3}{4}$ inch thick shall be placed over same; but this time wooden strip shall be placed 7 feet from wall, so that each joint in the layer will overlap joint in first layer about one foot. This layer must be rubbed smooth as fast as it is laid, using fine lime, sandstone dust, or cement on the surface while rubbing.

When this strip of floor is laid, remove the wooden strip and place it about 7 feet from the edge of the floor just laid, to receive the next section. When laying second section, hot mastic mixture must ex-

tend over first section about 4 inches, so that edge of cold section will become soft, thus making a perfect bond between sections. Cut off surplus material and rub joints thoroughly.

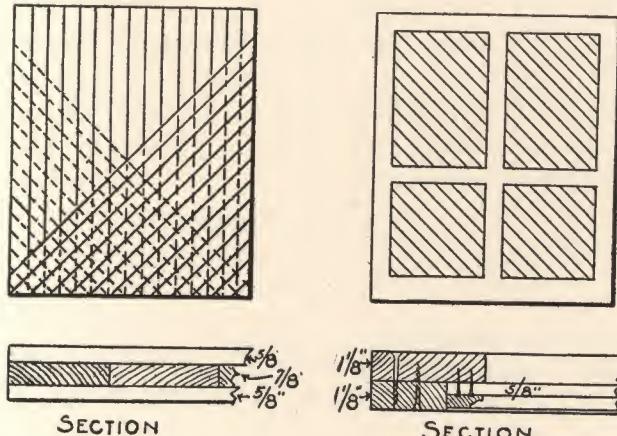
Floors one inch thick should be laid in one layer.

When laid on wood, floors should be

WORKMANSHIP—All work to be done in a thoroughly workmanlike manner.

GUARANTEE—The work will be guaranteed for 5 years that it will be absolutely waterproof, and that floor will be in good condition at the end of that time, if subjected to ordinary wear and tear.

CONSTRUCTION OF GARAGE



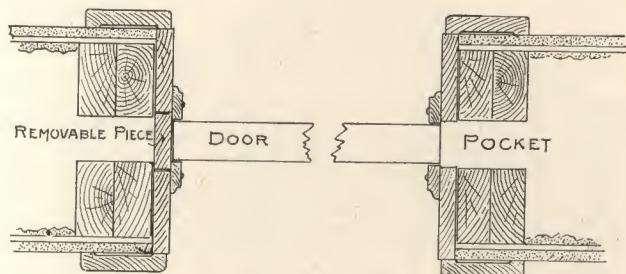
How to Make a Heavy Door for a Garage

made as clean and dry as possible, then covered with two thicknesses of building paper or one layer of waterproofing felt.

WATERPROOFING OF WALLS AND POSTS—All walls and posts should be

DOORS—Large-size garage doors that are strong and rigid, yet do not take up too much room in thickness, are the kind most wanted.

The accompanying illustrations show



Framing of Sliding Doors

painted with two coats of * * * asphaltum paint, from 3 to 6 inches above the floor line.

FILLET—After floors have been finished put fillet 3 inches around all walls and posts.

two sectional drawings with elevations suitable for this use. The first is made of three thicknesses of boards, as shown. The center is of $7/8$ -inch boards, placed vertically, and $5/8$ -inch ceiling, placed diagonally on both sides, covering the whole space and

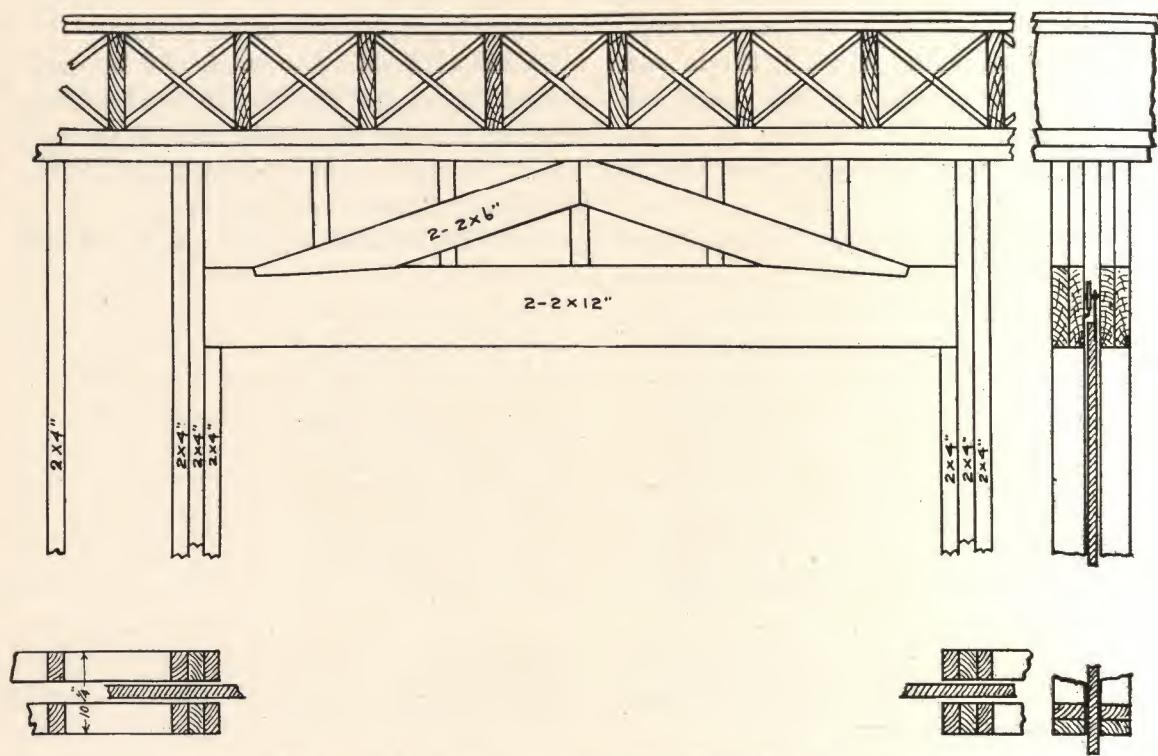
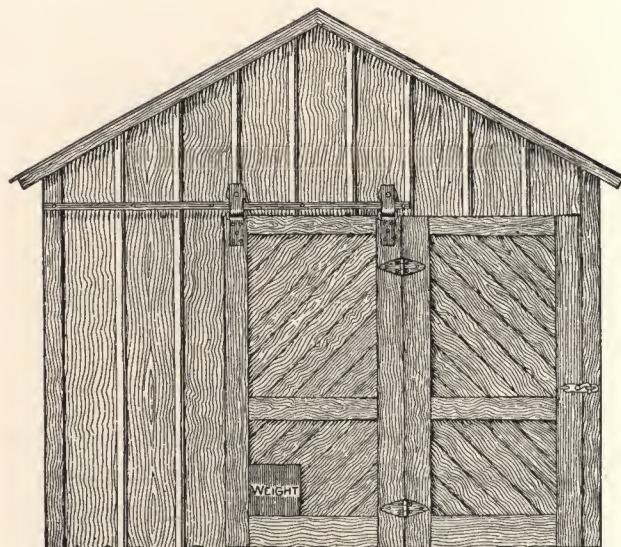


Fig. A. Safe Truss Construction over Wide Door Opening



Arrangement for a Wide Sliding Door for a Small Garage

well nailed. This will make a door $2\frac{1}{8}$ inches thick.

The second is made of two $1\frac{1}{8}$ -inch pieces for the framework, lapped and screwed together. The panel work is made of $\frac{5}{8}$ -inch ceiling, cut in and nailed with a stop-mould to cover the nailheads. All the laps and joints should be painted with white lead paint. This will make a door $2\frac{1}{4}$ inches thick.

OPENING FOR SLIDING DOORS—In the accompanying sectional diagram is shown the proper construction for sliding doors, the framing being correct for either single or double doors.

The drawing shows the arrangement for single door to slide only one way. There is a little pocket in the jamb on the lock side to admit getting the door in and out. This pocket can be concealed, as shown in the illustration, by setting in a piece of same thickness as the jamb and covering the joints with the stops. At the top, it is a good idea to let the top of the door be about an eighth of an inch below the stop, which should be wide enough to extend in close to the hanger, thus hiding the unsightly opening in the head jamb that would otherwise show when the door is open.

TRUSS OVER DOOR OPENING—Fig. A shows good construction of the framing above a wide door opening where the roof or ceiling joists run at right angles with the door opening. The truss may be omitted where the joists run parallel to the door, but it is a good idea to put in the double joist at the head of the opening as it furnishes an excellent bearing on which to fasten the track.

INGENIOUS DOOR ARRANGEMENT FOR SMALL GARAGE—A small garage that is only large enough to house an automobile must have a door almost as large as one end of the building. Frequently it is desired to hang such a door on rollers,

but the width of the small garage would not allow for a track of sufficient length to hang an 8-foot door in the usual manner. Instead of having one large door, two 4-foot doors can be made and hinged together, as shown in the accompanying figure. One of these doors is fitted with rollers, which run on a short track. The hinged door is opened and folded over the first door, and then both of them rolled back over a 4-foot space.

A 50-pound weight is fastened in the lower left-hand panel of the door, hung on the rollers, to counterbalance the weight of the door hung on the hinges. A hook placed in the cement floor on the inside of the doors at the center secures them when they are closed.

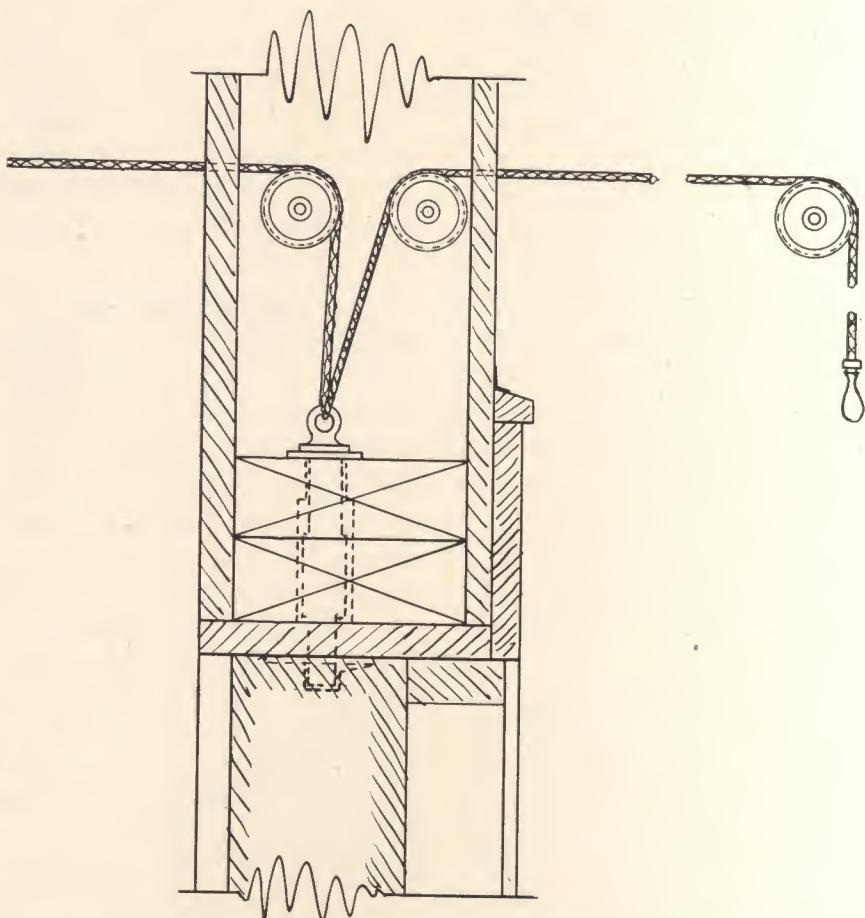
SIMPLE DEVICE FOR OPENING GARAGE DOOR—The cut shown herewith illustrates the construction of a very simple and inexpensive form of device, the use of which enables a person in a car outside or inside the garage to open the door of the garage without leaving his seat. The section shown is that of the wall of the building just above the door. The handle shown at the right hand is on the end of a rope which passes over a pulley pivoted near the top of a post located at some distance from the door and standing by the side of the driveway. This rope leads back to another pulley inside the wall and then down to the eye of a bolt and up over a second pulley. If the rope is fastened to the eye of the bolt, the door may be operated from either outside or inside by extending the rope downwards on the interior of the garage the same as on the post outside.

The release of the bolt from the slot shown in the top of the door, caused by simply pulling on the rope from either end, allows the door to be drawn back automatically by a properly arranged cord and weight on the inside of the door.

FRAMING FOR WINDOWS—One of the most important parts of the framing of any building is the construction connected with the window openings. This is a comparatively simple matter, yet it should be done with care, to insure against leaks. One of the best ways to frame the ordinary double-hung window to prevent leaks, is to gain the jamb into the sub-sill, letting

SINGLE-SASH WINDOWS—How to make a single-sash frame which will admit of hanging so that the sash can be opened and at the same time keep out the snow and rain in stormy weather, is a problem that has caused the carpenter more or less study for years. This is a style of window very often used in small garages.

We have found no better way to accom-

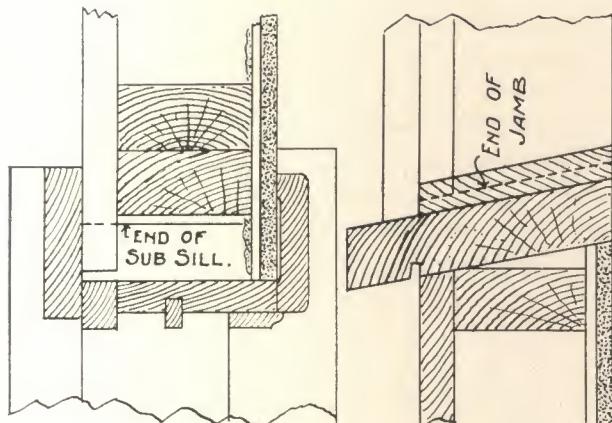


A Simple Device for Opening Garage Door without Alighting from Vehicle

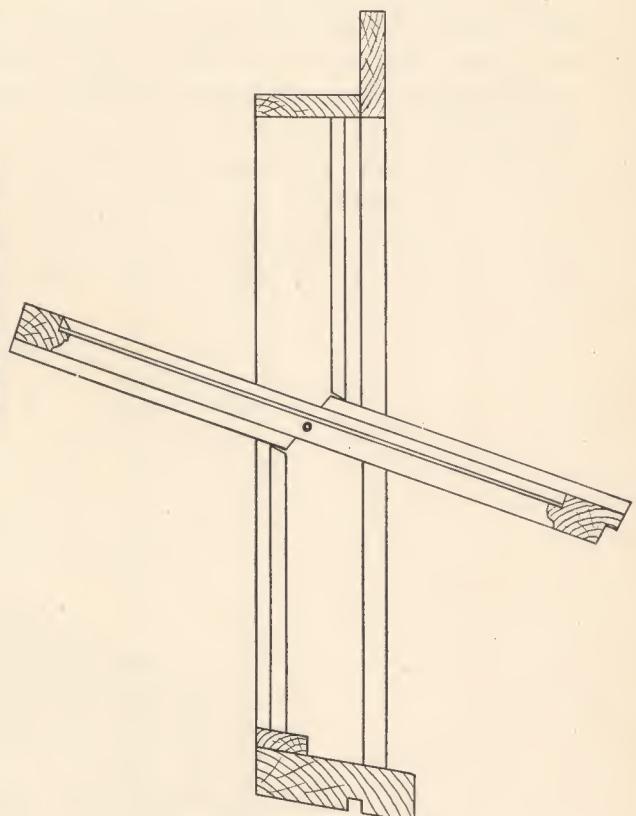
the end of this sill project same as for window sill, and only notch out enough of the back corners to fit nicely in opening for the window as shown by the accompanying sectional drawing. The joints should be set in white lead, and well painted on the outside.

plish the work than the arrangement shown in the accompanying drawing.

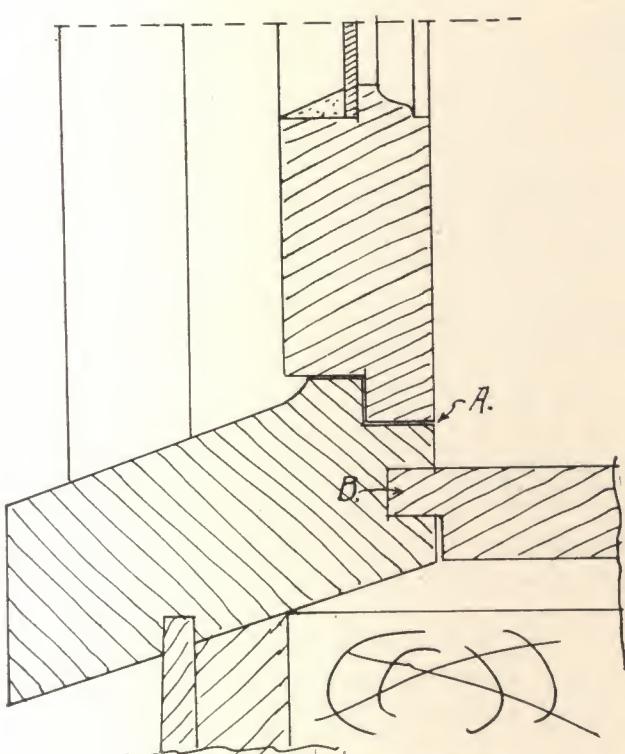
The sill is made with a lip, and then rabbeted, as shown at A. The sash is also rabbeted to fit the sill. The sill is plowed at B; and the stool rabbeted to fit into the sill. This allows the sash to be hung at the top;



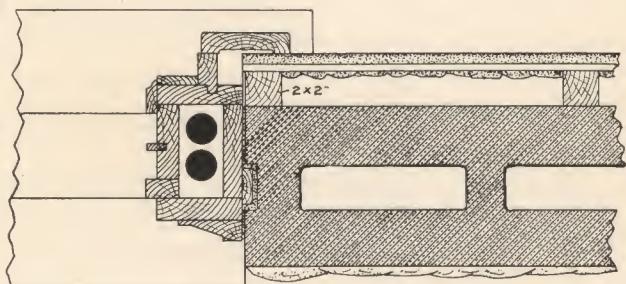
Simple Window Construction



Pivot Window Construction



Framing for Single Sash Window



First-Class Construction—Double-Hung Window in Concrete Block Wall

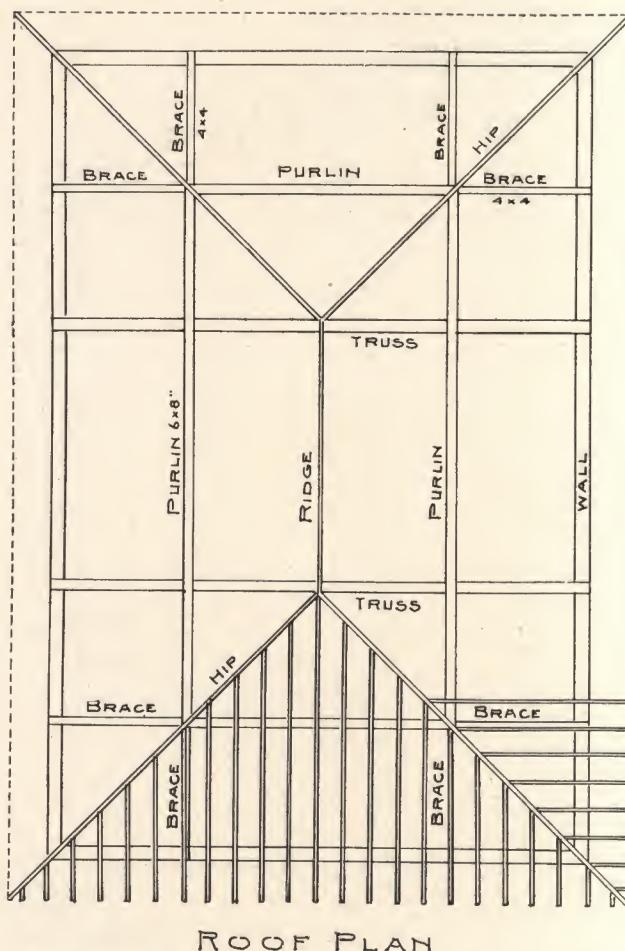
and, when closed over the rabbeted sill with the lip, it prevents rain and snow from beating in under the sash. If the sash is tightly closed, it is just about storm-proof—so nearly so, in fact, that not enough rain or snow will get through to do any damage.

With the ordinary window-sill, it is im-

possible to hang a single sash either at the top or on the side, on account of the bevel on the sill; and then the stool is in the way. Our experience has been that almost any attempt to hang a single sash in the frame such as ordinarily made, results in a very unsatisfactory job. If the window happens to be in some place much exposed, it will be found to be a great annoyance on account of leaks, which will admit water.

A frame constructed with the sill and sash rabbeted as shown in the sketch, is as nearly storm-proof as it is possible to construct one and have the sash hung so that it can be opened readily.

A PIVOT WINDOW—The accompanying figure shows as good a construction as



Roof Framing Plan for Large Concrete Block Garage

possible to hang a single sash either at the top or on the side, on account of the bevel on the sill; and then the stool is in the way. Our experience has been that almost any attempt to hang a single sash in the frame such as ordinarily made, results in a very unsatisfactory job. If the window happens to be in some place much exposed, it will be found to be a great annoyance on ac-

count of leaks, which will admit water. There is for a pivot window, both as to appearances and as to storm-proof qualities. This is a type of window that is frequently desirable for small garages.

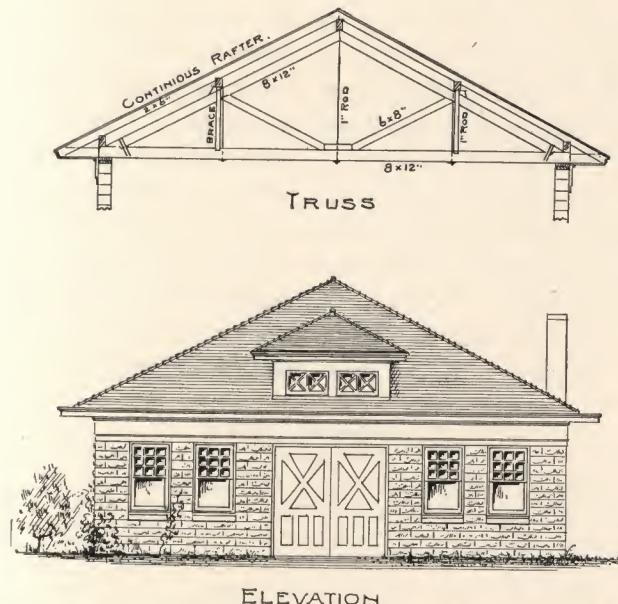
WINDOW FRAME FOR A CEMENT BLOCK WALL—Blocks have been used with very good results in garage construction, where a thoroughly first-class job was desired, furring, lath and plaster

being used. It is sometimes a question just how the window-frames should be put in to make this kind of a job most successful.

The cut herewith shows the approved method. A special wide mould is used on the face of the frame to relieve the plain surface that otherwise would show. This mould should carry across the top so as to show the same width as at the sides, and, when properly made to work with the blocks, will look all right. Care should be

Possibly the most noticeable features in the change in external appearance of the building are the change in size of windows, the doing away with the two small side doors, and the cutting down of the slope of the incline leading to level of stable floor.

At a closer viewpoint it will be noticed that the original siding on the exterior has been removed, and a lath and plaster wall ceiled on the inner side, substituted in its place. The section of the wall shown on



Roof Truss and Front Elevation of Large Concrete Block Garage

taken to have tight jambs; and as most blocks are made with a slot at the ends, this can be successfully done by nailing a strip on the back of the frame so as to come within the slot and then filling in the remaining space with mortar. This not only breaks the continuous crack, but also makes an excellent tie in the wall.

A BARN CONVERTED INTO A GARAGE—The figures on pages 62 and 63 show how an ordinary small stable or barn was converted into a very serviceable and commodious garage. The views on page 63 show the external appearance of the structure before and after the remodeling.

page 62 illustrates this change, together with the removal of the original stable floor and floor-joists and the substitution of a concrete floor, of medium thickness, laid directly upon the ground. This concrete floor was carried up, as shown in figure, in a bank all around the walls of the garage, and extending upwards as far as the old floor level. This acts as a protection to the side walls of the building.

A noticeable point in the reconstruction is the doing away with the grade leading to the old floor level. Since the concrete floor is laid directly upon the ground, a slight slope of the incline will suffice.

The removal of the original horse stalls allowed plenty of space for a fairly good-sized workroom at one end of the garage.

LARGE CONCRETE BLOCK GARAGE

—A garage 40 by 60 feet, made of concrete blocks and having a trussed hip roof, is shown in the accompanying illustration. The purpose of this design is to do away with supports through the building, and yet keep the roof as light and inexpensive as possible.

The size of the building is very convenient to roof up nicely. Being 60 feet in length, it will require but two trusses through the middle, which will place them at 20 feet from each end, so that the hips will catch the peak of the trusses, as shown. Purlins can be run at the central point of the rafter lengths, and braced from the chord of the main trusses and from the walls, as shown in the section.

With cement block construction the window frames are made to work to the size

of the blocks rather than the blocks to the frames. In this the blocks are supposed to lie 12 and 24 inches. The large door is planned for 10 feet wide, including the frames, and the windows are 3 feet wide, with frames included. This would leave 3 feet between the openings, thus avoiding all unsightly fitting of the blocks to the frames where they have to be chipped off at the ends, thereby causing uneven lengths by not having taken due consideration in laying out the work. Note, too, that caps for the openings are avoided by letting the frames extend up to the frieze. This makes an inexpensive construction, and at the same time gives a very neat appearance. Any height of block can be used, as best suits the individual taste; but, whatever dimension block is used, plan to work the full length and height of same to avoid patching up around the frames. Remember, misfits can be avoided at the start, but never—well, hardly ever—at the finish.



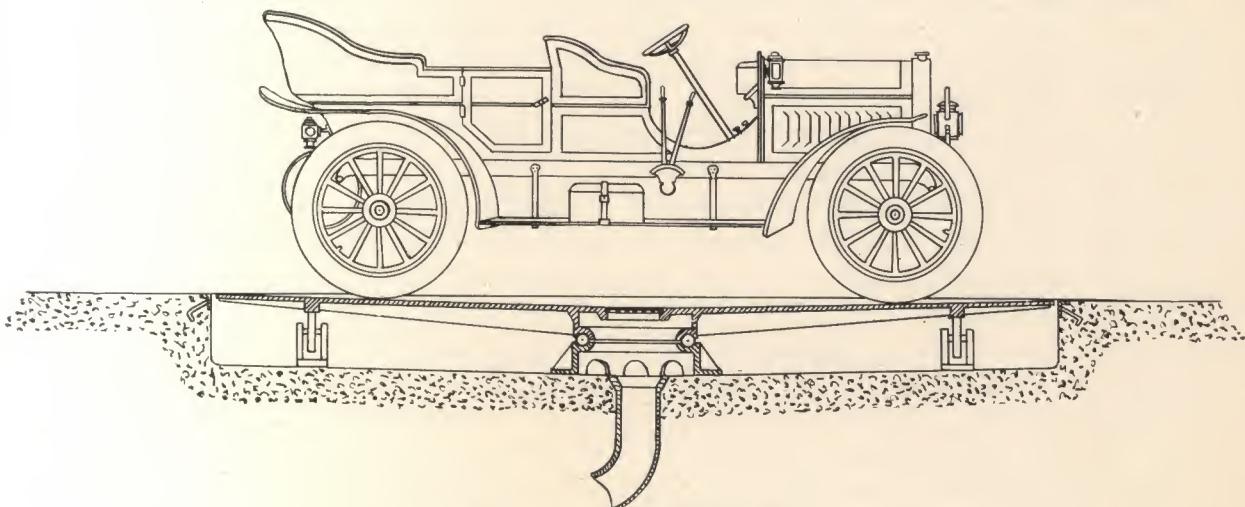
Garage Equipment and Accessories

No well-equipped and thoroughly modern garage is considered complete without the many time-saving and labor-saving devices shown in the following pages. To the owner of a large car, some of them are almost indispensable in working around and handling with ease such a large and heavy body. To the owner of a small car or the man who generally takes care of his own machine, many of these devices soon pay for themselves in the saving of time and labor to a busy man.

TURNTABLE—Possibly one of the most important labor-saving devices in the equipment of the modern garage is the installation of some form of turntable, either in or upon the floor of the garage. Where

street would otherwise be necessary. Another advantage of the use of a turntable is the ease with which a machine can be turned around into the light when washing or repairing broken parts.

The accompanying figure shows a common form of turntable located in a pit in the garage floor. As will be noticed, a circular platform dished towards the center and braced on the under side by heavy ribs is supported at the center by a heavy ball bearing, and near the edge by a circular ridge on the lower side of the platform. This ridge rests on several small wheels placed with their axles in standards resting on the bottom of the pit. These wheels prevent the platform from tipping when



Automobile Turntable in Pit

floor space is limited, or where there is but little chance for backing or turning, such a device is practically a necessity. The value of a turntable is very apparent where the garage is small and located on a busy thoroughfare where backing out into the

the car is run onto the turntable, and also act as roller bearings when the platform is turning.

The dishing of the platform in the center causes water or any drip from the machine to collect in the center and be dispos-

ed of through the grating shown. The connection between center of turntable and sewer, as shown, makes the platform a very convenient place for washing the machine. Holes through the bottom plate of the ball bearing and connecting with the sewer prevent an accumulation of water in the pit, and also help in the removal of any dirt which may collect in the pit. The turntable platform should fit the circular hole fairly close, so as to not leave a crack through which larger particles like pieces of oily waste, etc., may fall.

INSTRUCTIONS FOR INSTALLATION OF 13-FOOT 4-INCH AUTOMO- BILE TURNTABLE.

FORM—A wooden form should be constructed exactly 13 feet 5 $\frac{1}{2}$ inches outside diameter, and about 18 inches deep. This form should be carefully set, so that the top is level with the finished floor line of the garage.

PIT WALL—Build the pit wall by filling in the concrete around the form until within about 4 inches of the floor level.

RING—Place around the form the three pieces of 3 by 2 $\frac{1}{2}$ -inch angle-iron comprising the rim. If these have become bent out of a true circle in shipping, they must be carefully formed to fit neatly against the outside of the wooden form.

Block these angles up to the level of the top of the wooden form. Place the securing bolts by cutting out the form to clear the nuts, and fill in the concrete to floor level. Do not disturb until concrete is set.

PIT BOTTOM—Assemble Wooden Form. Drive a tapered 4 by 4-inch timber plug about 18 inches long into ground in center of pit, leaving top 6 inches below level of floor. Drive four 4 by 4 by 24-inch tapered timbers into ground in places which will receive the foundation bolts and center casting. Drive them so that the tops will be about 6 inches below floor level.

Drive 3 by 3-inch tapered plugs about

16 inches long in pit in places which will receive the foundation bolts for the roller castings. Have top of these 8 inches from floor level. Put in concrete pit bottom around wooden plugs to within 1 inch of the level shown on the drawing.

After concrete is set, remove all plugs except the center one. Put foundation bolts in holes and cement in place to proper height and spacing at an even distance around the pit as measured from center pedestal and rollers.

Locate the exact center of the 3 by 2-inch angle-iron ring by careful measurement, and mark by tack on center wooden plug.

CENTER PEDESTAL—Place center pedestal in place, locating the ball race exactly concentric with the mark on the center wooden plug. Place fillers on shims under this pedestal to level it up and raise its base to height shown on the drawing. Put nuts on bolts, and put balls on race.

OUTSIDE ROLLERS—Similarly shim outside roller castings to level shown. Tighten up nuts on bolts and put turntable platform in place after bolting it up, as follows:

PLATFORM—In assembling the turntable platform, place the three sections together, bottom side up, on a level floor, with a 6 by 6-inch by 1 $\frac{1}{2}$ -inch thick board under the center ends. These tops are cast in one piece and split afterwards; so care must be taken to follow markings in assembling, in order that the correct faces shall come in contact.

Be sure to clean out all paint and dirt between faces. In bolting sections, do not try to get each bolt perfectly tight at once, but partially screw up each nut until all are tight and platform is securely drawn together.

When platform is placed on center pedestal, it should turn easily on balls with about $\frac{1}{2}$ inch clearance between outside

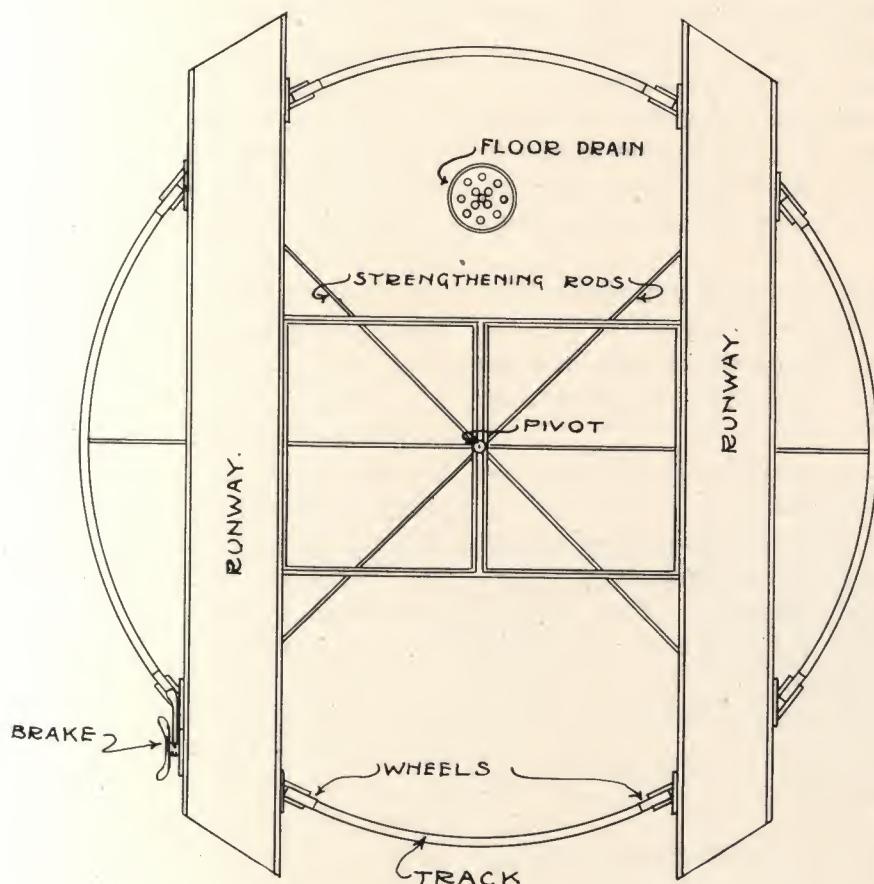
edge of platform and the angle-iron rim.

If pedestal is correct height, the outside edge of the platform will be level with the ring around the edge of pit.

If rollers are correct height, there will be about $\frac{1}{2}$ inch clearance between back of track on platform and tops of rollers. The

Finish floor of pit, and put top in place.

PITLESS AUTOMOBILE TURN-TABLE — Another form of automobile turntable is shown in the accompanying cut illustrating the Pitless Automobile Turntable. This turntable is placed directly on the floor, and does not require



Plan of Pitless Automobile Turntable

platform should touch these rollers only when overbalanced by a load placed on one side of the center. If heights of rollers and pedestal are found to be correct, remove the top and grout them in with cement.

any bolts or screws. It is compact and complete in itself, and will not tilt. It is guaranteed to sustain the weight of any car, and its manufacturers claim that an ordinary workman can install it in thirty minutes. When installed in an already fin-

ished garage, the only expense is in the concrete approaches, and these can be made by the owner himself at a very small expense.

If the space is limited for turning the automobile, and it is necessary to turn steering gear two or three times in backing out, the price of a turntable will soon be saved from the wear and tear on the steering gear and the tires, without mentioning the possible damage to fenders and lamps.

There is ample space on the runway for changing tires. The turntable is very handy in washing the car and in oiling or filling the tank. The car can be turned to the gas or oil tank, which saves slopping and spilling, as is done in carrying the oil to the car.

A few details of the construction of the pitless turntable are as follows:

Runways are fifteen inches wide and are supported by eight-inch machine-faced wheels.

Wheels run on circular steel track one and one-half inches high.

King-pin is held firm in center by six stay rods bolted to track; and center frame, which is bolted to runways, is held by king-pin, making it impossible to move the wheels off the track.

Runways are two and one-half inches above the floor.

Approaches clear the floor by one-half inch.

A wheel brake holds the table in position; it is operated by the foot.

Runway ends are cut on a circle and have no approach. In new work the concrete is laid flush with runway, making an ideal construction for a private garage, as there is no elevation in running on and off.

A pit may be included in the construction of a garage, if desired; it may be placed inside of track.

The Pitless Turntable does away with the expensive concrete surface in the yard, the

cost of which often exceeds the price of the turntable. The beauty of the yard may also be preserved. In the Pitless Turntable there is no place for the accumulation of oil and waste, which might become ignited and cause a loss by fire.

This turntable is made in four different sizes to turn the smallest electric as well as the largest touring car.

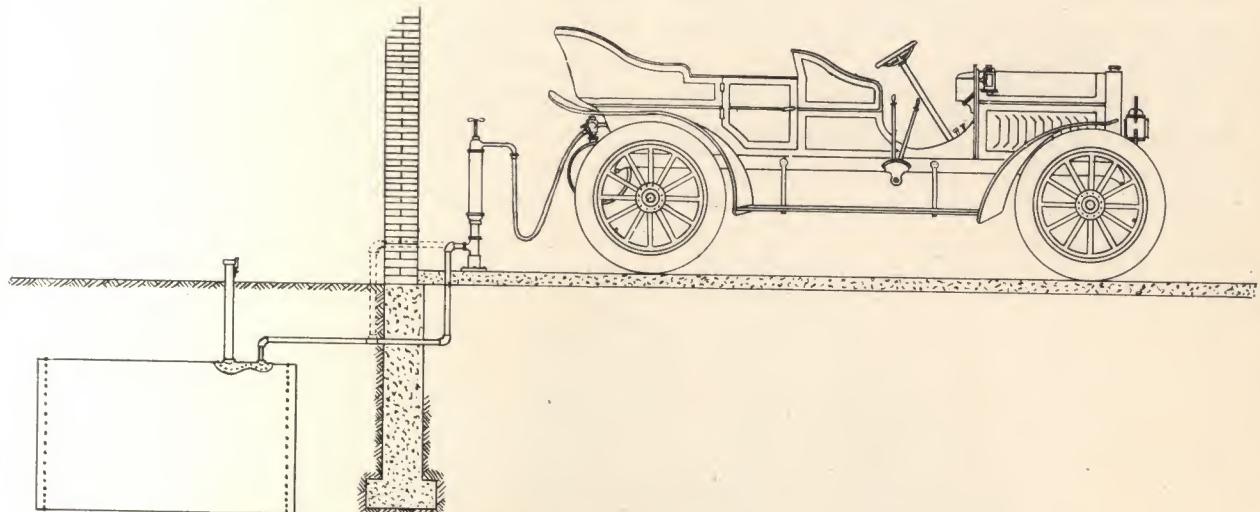
GASOLINE PUMP AND STORAGE—

The scheme shown in the accompanying figure illustrates one method of keeping a ready supply of gasoline on hand with safety. The tank shown is buried *outside* of the garage and has only two openings—one shown extending up through the ground for filling, and one for a smaller pipe, which leads through the garage wall and connects to the supply pump. The outside opening used for filling should be provided with a close-fitting screw cap or plug, and should be kept tightly closed. The depth of gasoline in the storage tanks may be determined at any time by simply inserting through this opening a clean stick. The depth of gasoline will show on the stick when it is removed. Also, see that all pipe connections are *tight*.

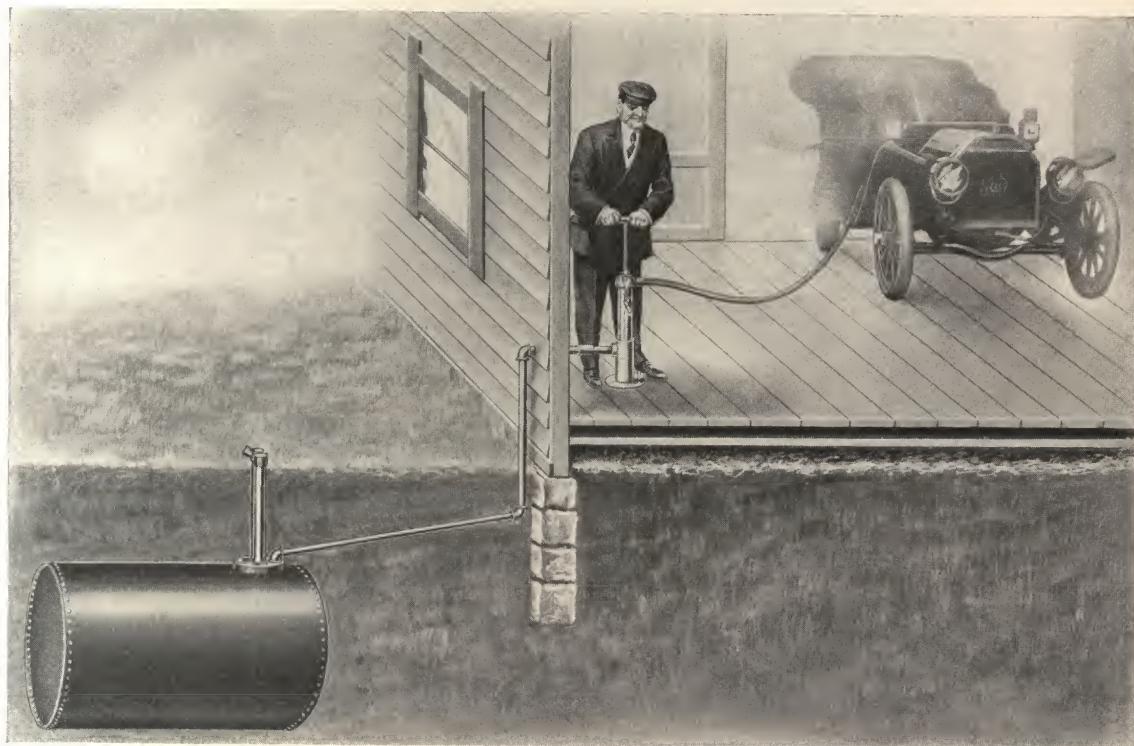
The pump shown in the figure is connected direct to the supply pipe from the outside tank. The size of the pump barrel is such that one complete stroke of the pump forces one gallon of gasoline into the tank on the machine. This is a very convenient method of measuring the quantity taken into the tank on the machine. The particular system here shown is known as the "Bowser."

Another system of storage and measurement is shown in the accompanying cuts of the "Tokheim" Gasoline System.

This outfit is designed for automobile garages. It is claimed to have many exclusive features of merit—features which provide for safety, convenience, and economy in handling gasoline.



Gasoline Pump and Storage. The "Bowser" System



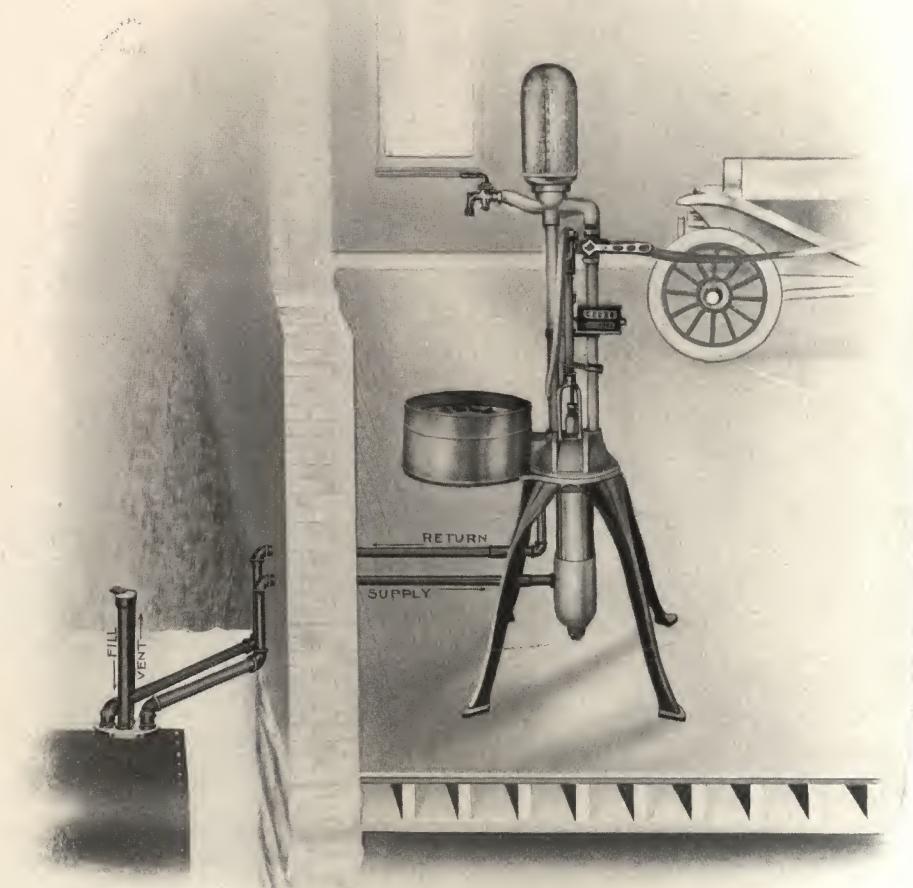
Tokheim "Safety" Long-Distance Gasoline System

The dome, self-measuring, price-computing pump will draw and measure oil very rapidly from an underground tank, which can be located at any distance or angle from the building.

The detail cut of the three-way discharge valve and gallon counter shows the price-

per minute. The pump can be changed in a moment by the turn of the lever handle of this valve for discharge through hose or through dome.

The counter accurately registers the discharge in pints and gallons up to 9,999 gallons, and automatically repeats. It can be



Tokheim Gasoline System

computing scale and the registering device to a better advantage.

With the three-way valve, gasoline can be measured and discharged into the automobile tank at a rate of 8 to 10 gallons

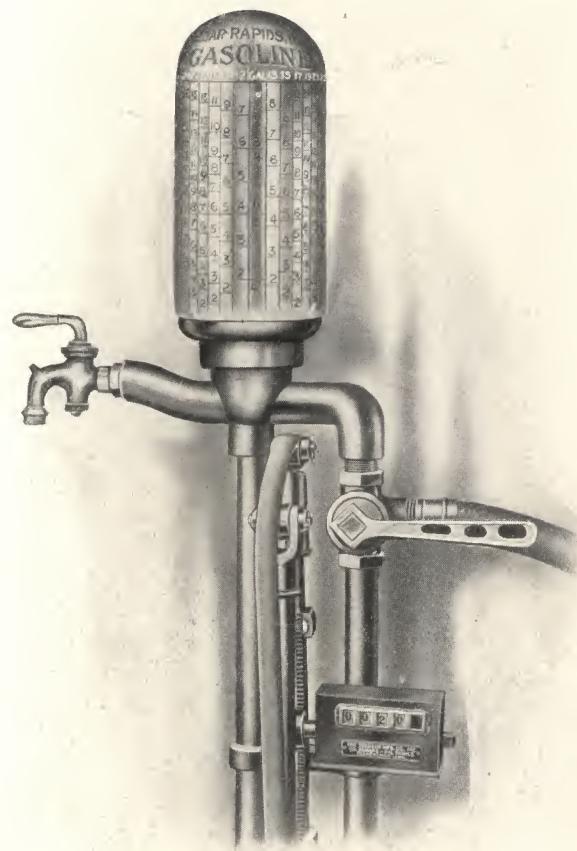
unlocked and reset at any time desired. The counter is well built from heavy materials and cannot be tampered with. It is claimed to be thief-proof. The figures are one-half inch high and easily read.

ROLL-TOP OIL CABINET—When large quantities of lubricating oil are to be kept around the garage, safety is a matter of great importance. An oil cabinet which can be closed and protected from the match-end carelessly thrown aside, is of extreme value.

These cabinets are made in all styles and sizes, and for both gasoline and lubricating oils. The accompanying cuts show some of

dered. It is fitted with removable drip-pan with fine brass strainer, screen, and iron grate. Standard size, 65 gallons.

As shown by the cut of the open cabinet, the outfit is equipped with the Tokheim Self-Measuring Pump, discharging at a single stroke a quart, a pint, or half-pint. The pump is constructed from galvanized iron and finished in silver, aluminum, and gold. It is fitted with extra heavy brass



Three-Way Discharge Valve and Gallon Counter

the details of a good representative cabinet.

These cabinets are built from the finest grade of oak and can be finished in any color desired. The top rolls up and down easily, and it is thoroughly dustproof.

The tank is made from best quality galvanized tank steel, double-seamed and sol-

cylinder, with brass valves, and the Tokheim Anti-Drip Plunger Faucet.

In many of these cabinets a special pump connecting with an underground or outside gasoline tank is placed beside the oil pump, and both thus protected from dirt and dust by the rolling front. These cabinets are ornamental as well as useful.

FIRE PROTECTION APPARATUS FOR GARAGES.*

Of the fittings of any garage, fire-protection apparatus ranks among the most essential, because, no matter how large or small a garage may be, the possibility of a fire is always present. This is decidedly true of the smaller and less important garages, which are, as a rule, not so well

Some of the larger and more modern garages are equipped with automatic sprinkling systems connected with a water tank placed on the roof or directly with the city water-supply system. While the sprinkling system is used, it is not considered very favorably, because of the high relative cost of installation compared with the extent of the protection afforded.

It is claimed that the main defect of the



Tokheim Roll-Top Oil Cabinet

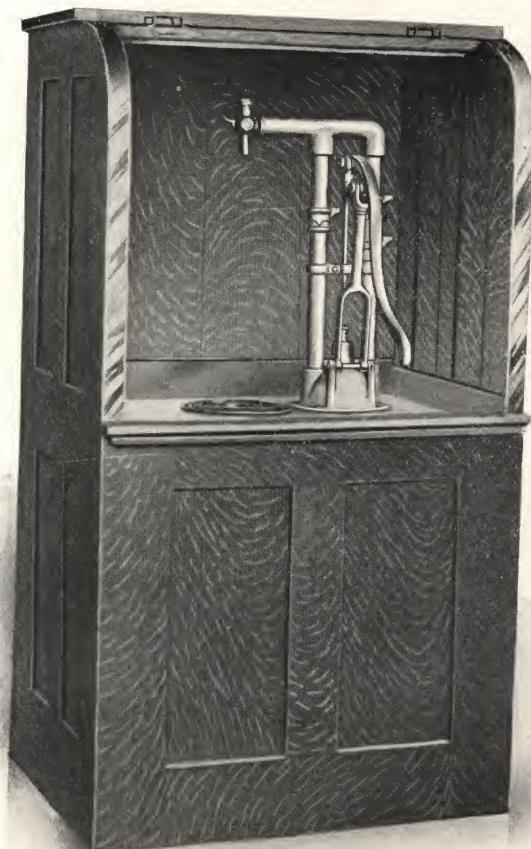
equipped for safely handling and storing gasoline and oil as those housed in modern fireproof buildings.

system is its inability to supply a sufficient quantity of water to extinguish a purely local but generally extremely hot fire, such as garage fires invariably are. Another shortcoming of the system is said to be,

*Courtesy of "Horseless Age," April, 1909.

that, since most modern garages have high ceilings in the car storage spaces, there is a likelihood of the fire getting well started before the apparatus will release the water, which would probably also be released from a number of other adjacent points of the system at the same time and do a great

circuit through a battery and an audible alarm signal, and in some cases an indicator to show the location of the fixture closing the circuit. The principle of operation of the circuit-closing fixtures is that the increase of temperature directly above a fire will cause a rod connected to one side of



Tokheim Roll-Top Oil Cabinet—Open

deal of damage. It seems, therefore, that the sprinkler system would find better application in the stock and store rooms and offices than in the car storage or gasoline and oil storage spaces.

The automatic fire-alarm systems generally consist of a pair of wires attached to the ceiling, and having fixtures connected at regular intervals for closing the electric

the circuit to expand and thereby close the circuit. Another system operates when one or more fusible plugs melt and thereby open the circuit, thus giving the alarm. The objection to automatic fire alarm systems for garages seems to be that they are not reliable, because, as a rule, they are seldom tested and inspected, and, as a result, the operating fixtures corrode and do not work

satisfactorily at the critical moment. Another objection urged against the system is that the local temperature must be quite high before the alarm is given. This system would also find better application in departments of a garage other than the car storage space.

thrown directly at the base of the flame a large quantity will be required, and if the fire should be in the vicinity of the car motor the sand is likely to find its way into the working parts and cause some damage.

Chemical extinguishers, which operate by excluding the air from the flames, are used



Good Work or Repair Bench for Small Garage

The time-honored system of standpipes connected with a positive high-pressure water supply, and having a hose with a nozzle permanently attached to a stop-cock or valve on the standpipe, is used to a large extent in garages, and, unless a fire comprises burning gasoline or oil, is capable of affording excellent protection—generally, however, with some damage due to the large amount of water used.

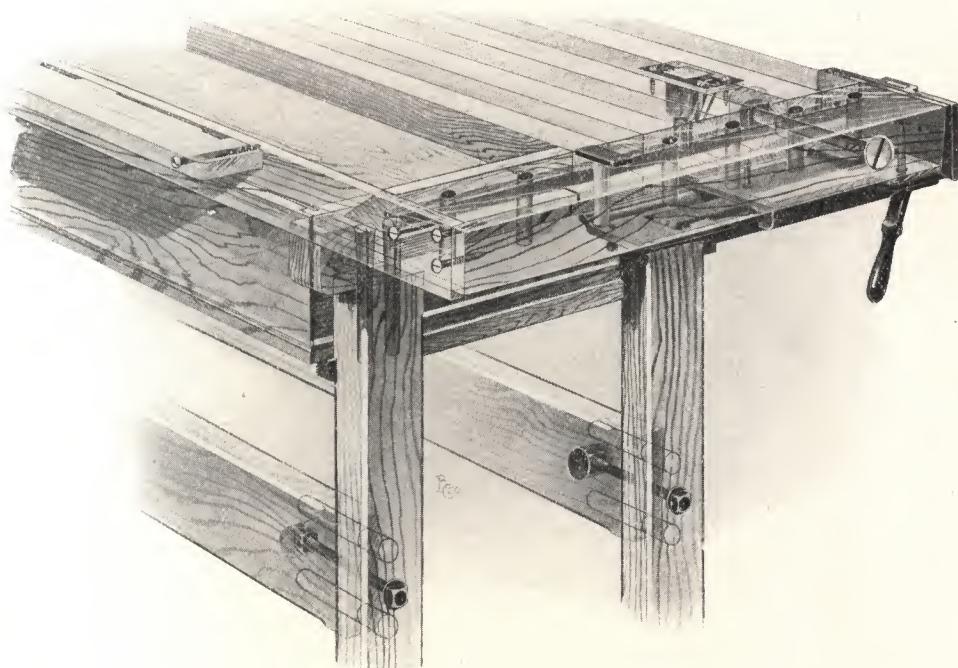
Pails of sand are used to a great extent as a protection from gasoline fires, because, if the sand is properly spread on the fire, it will exclude the air and extinguish the fire. However, unless the sand is forcibly

in various styles. There are two general types of these, namely: the powder and the liquid type. The most generally used form of the powder type consists of a metal tube, generally about 22 inches long and 2 inches in diameter, which is filled with a powder consisting mainly of powdered sodium bicarbonate. The tube is usually suspended by a ring attached to the cover which closes the upper end of the tube; and, by jerking down the tube, the cover is removed, and the contents may be scattered at the base of the flames.

Liquid-type fire extinguishers are made in various forms, and generally depend for

their operation upon the formation of carbonic acid gas by the combination of sulphuric acid and sodium bicarbonate which is held in solution by water contained in the extinguisher. Another type for use in

HOW TO CONSTRUCT A WORK OR REPAIR BENCH—One of the prime necessities for the home garage is a well-built work and repair bench. No mechanic, whether amateur or profes-



Phantom Sketch of Work Bench, Showing Construction

places where the temperature is apt to be below the freezing point of water, generally consists of a tank containing a saturated solution of calcium chloride in water, the expelling force being furnished by liquid carbonic acid gas contained in a steel bottle held in the head of the extinguisher. The gas is liquefied at about 900 pounds pressure at 54° F. There is still another form of liquid-type extinguisher from which the solution is forced by a hand-operated pump.

Precautions to be observed in the handling and storage of gasoline and oils are so thoroughly covered by the rules of the board of fire underwriters as not to require mention here.

ional, can accomplish much unless he has a good, solid place to work, and a place where he can keep the various tools and small supplies required about a car. Benches can be purchased ready-made that would suit this purpose very well, but probably the most satisfactory way is to build a special bench and arrange and equip it for the special requirements of automobile work.

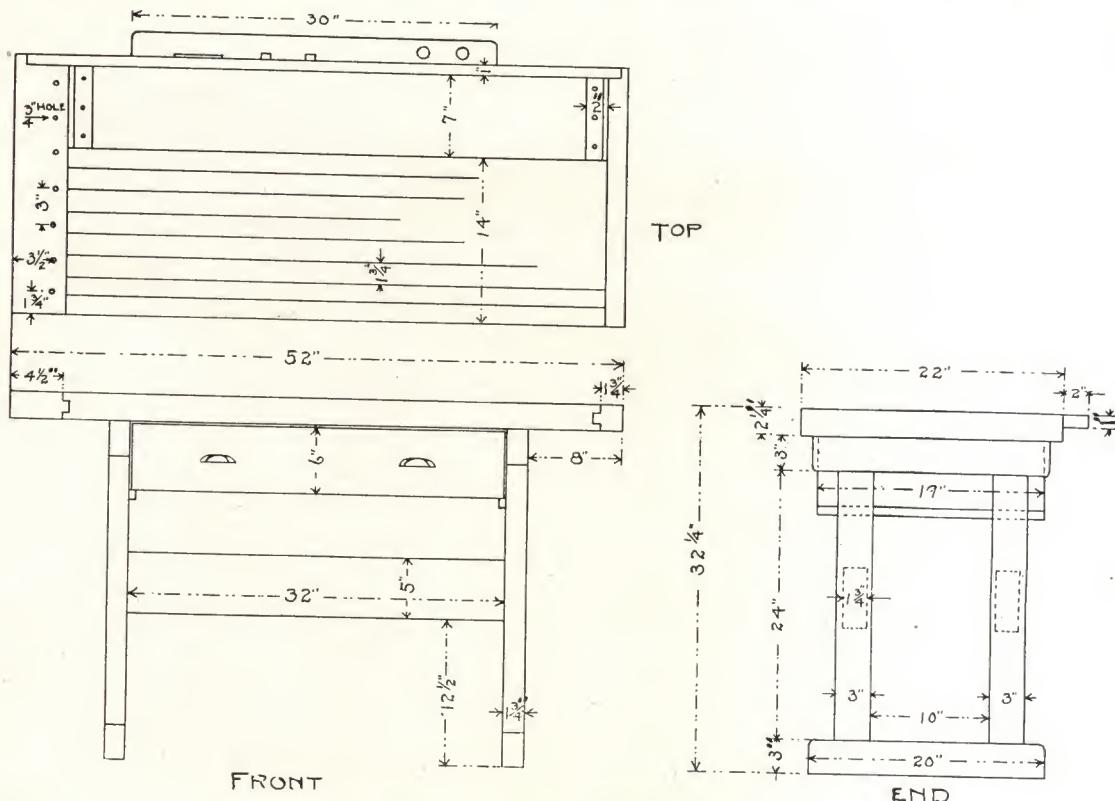
The accompanying illustrations show a work and repair bench of this kind. By observing the detailed instructions which follow, its construction will offer no difficulties, even for the amateur builder.

In the bench with the single drawer this

drawer provides space for small tools and supplies, while to the back is fastened a tool rack. This bench is ample size for a small garage, following the dimensions as given in the accompanying detail drawing.

This same top construction may be used

desired. To fasten a piece, throw the lever vertically, pull the jaw out sufficiently to permit the piece to be inserted, move the movable jaw up against the piece by pushing on the lever, then swing the lever to the right about a quarter-turn.



Working Plans of a Good Work or Repair Bench

and a bench built with the base completely filled with drawer space, as is also shown in one of the accompanying illustrations.

One who has ever used a rapid-acting vise will not need to be told the advantages of that style over the old-fahioned continuous screw kind which our fathers used. To one who has never used one, we suggest that the time alone which is saved, not to mention the satisfaction in being able to get quick results, is well worth the small difference in cost. In the vise shown in the picture, throwing the lever to a vertical position permits the movable jaw of the vise to be moved out or pushed in as far as

HOW TO MAKE THE BENCH—Begin work upon the frame. Make the ends first and glue them up. The phantom sketch given in one of the accompanying cuts shows the top and bottom horizontals doweled to the verticals. The stock bill calls for enough extra length for these verticals to permit their being tenoned entirely through the horizontals, then glued and wedged. There is a cross strain put upon these joints that necessitates their being made as strong as possible.

From the detail drawing it will be seen that the holes for the draw-bolts of the girts are in the middle of the verticals, so

that top and bottom of the end frames are reversible.

Square up the girts and bore for the dowels and draw-bolts. Use a six-inch machine bolt. Chamfer the parts, as shown in the picture. These parts may now be assembled.

Make the top next. This will prove the most difficult part of the whole project, be-

in the picture, this cannot happen, for the strain is along the length of the bolster and not across the glue joints.

It might be urged—and justly, too—that it is contrary to the principles of good construction to join members so that end grain and side grain are together. However, in this case the top, being but 14 inches wide, is not inclined to shrink or swell enough



Work or Repair Bench with Drawers

cause of the bolsters which are to be tongued and grooved to the ends of the bench top proper.

The ordinary bench does not have these bolsters, and the autoist may, if he likes, make the top without them, making the top surface level for its full width. Experience with both kinds of tops has shown the writer that the cross clamping between vise dog and bench dog will, unless done by an experienced mechanic, open up the glue joints. With the bolster, such as is shown

under ordinary conditions—providing the wood used has been thoroughly seasoned—to cause any trouble.

The top proper is made up of eight pieces $1\frac{3}{4}$ inches wide, joined and glued. These are surfaced after the glue has set, so that the top shall be $2\frac{1}{4}$ inches thick, the bolsters having been tongued and fastened into the grooves cut in the ends of the top. The board which forms the bottom of the tool recess is rabbeted and set into grooves in the back and top proper.

To make it possible to easily brush this recess clean, two beveled pieces are fitted and nailed at either end of the recess.

The location of the holes in the tool rack is a matter for the ingenuity of the worker, and will depend on the tools he is to use most frequently.

The top is to be fastened to the framework, as is the bench to be fastened to the floor, by lag or coach screws. Four screws are sufficient for all.

The drawer sides are to be made of $\frac{7}{8}$ -inch stock and thoroughly put together. The ledge or tongue-and-groove joint is to be used at the corners, and the bottom of $\frac{3}{8}$ -inch stuff is to be "let into" the sides and back.

ITEMIZED STOCK BILL FOR BENCH

—For a first-class bench nothing but the best hard maple should be used, and it must, by all means, be thoroughly seasoned.

Mill bill for frame, sanded:

	Thick	Wide	Long	
4 horizontals.....	$1\frac{3}{4}$	3	$20\frac{1}{2}$	S-4-S
2 horizontals.....	$1\frac{3}{4}$	5	$32\frac{1}{2}$	S-4-S
2 horizontals.....	$\frac{3}{4}$	$1\frac{3}{4}$	$19\frac{1}{2}$	S-4-S
4 Verticals.....	$1\frac{3}{4}$	3	30	S-4-S

For the top, not to be sanded:

	Thick	Wide	Long	
1 piece.....	$2\frac{3}{8}$	5	$22\frac{1}{2}$	S-4-S
1 piece.....	$2\frac{3}{8}$	$2\frac{1}{4}$	$23\frac{1}{2}$	S-4-S
8 pieces.....	$2\frac{3}{8}$	$1\frac{1}{8}$	$46\frac{1}{4}$	S-4-S

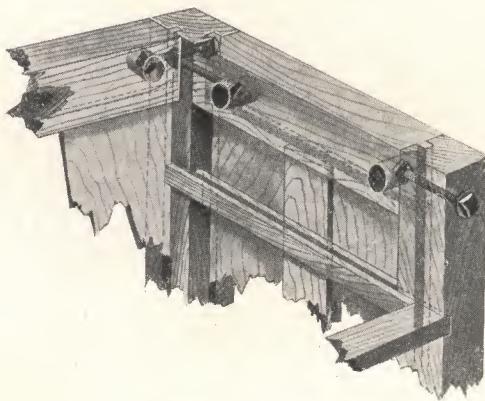
To be sanded:

	Thick	Wide	Long	
1 piece.....	1	8	$46\frac{1}{4}$	S-2-S
1 piece.....	1	$2\frac{1}{4}$	52	S-4-S
1 piece.....	1	2	30	S-4-S
2 pieces.....	$1\frac{1}{4}$	2	$7\frac{1}{2}$	S-4-S

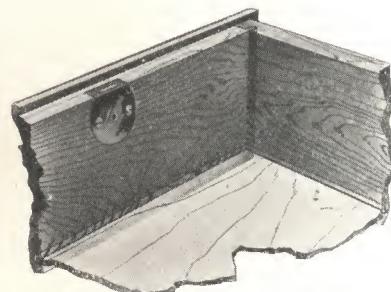
For the drawer, to be sanded:

	Thick	Wide	Long	
2 pieces.....	$\frac{7}{8}$	$6\frac{1}{4}$	$32\frac{1}{2}$	S-2-S
2 pieces.....	$\frac{7}{8}$	$6\frac{1}{4}$	$19\frac{1}{2}$	S-2-S
1 piece.....	$\frac{3}{8}$	22	32	S-4-S

A bench with a maximum of drawer space is shown in one of the accompanying cuts. The dimensions are: Height, 32 inches; length of top, 60 inches; width, 24



Frame Construction



Drawer and Lock Construction

Details of Construction for Garage Work Bench

A bench made of poorly seasoned maple is certain to prove a great disappointment. Order the stock mill-planed and sanded, as indicated in the stock bill. Stock specified S-2-S, surfaced on two sides, has an allowance of $\frac{1}{4}$ inch for dressing. Stock specified S-4-S is of exact width and thickness. All stock is ordered $\frac{1}{2}$ inch extra length to allow for squaring the ends.

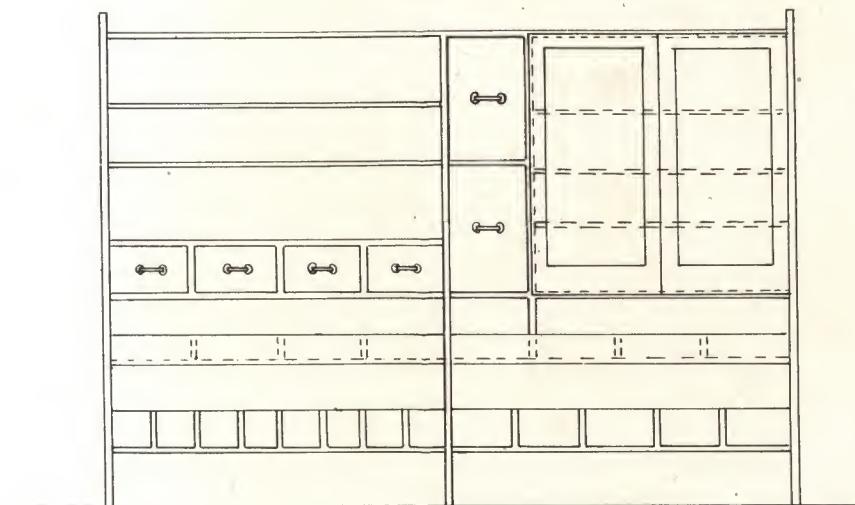
inches; thickness of top, $2\frac{3}{8}$ inches. The tool recess is 7 inches wide. The legs are 3 inches square and the rails $3\frac{1}{2}$ inches wide. The general tool drawer is $5\frac{1}{2}$ inches high, 38 inches long, and 20 inches deep. The smaller drawers are 5 inches high, $16\frac{1}{2}$ inches long and 20 inches deep. The paneled tool rack is 34 inches long and 7 inches high.

The paneling is to be made of clear, kiln-dried birch; the frame of clear, kiln-dried hard maple.

These benches should be finished with a

are especially convenient for heavier parts and tools.

With a cabinet of this type in the garage, if well stocked with the more common small



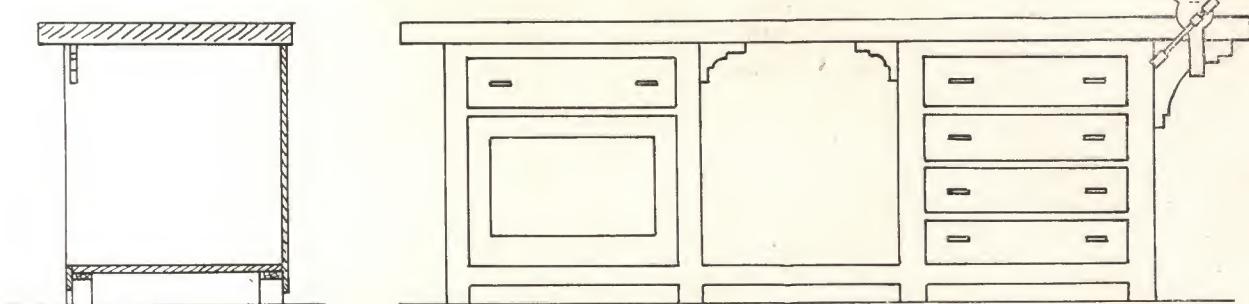
Tool Cabinet

liquid filler rubbed down and followed with several coats of shellac. The tops of hard maple benches are frequently finished by thoroughly rubbing in several coats of boiled linseed oil.

TOOL CABINET—The tool cabinet shown in the accompanying illustration is

tools and minor supplies, a great many small repair charges may be saved.

If the tool cabinet just shown is to be supplemented by a work bench, the accompanying figure shows a type of bench which is very serviceable. This bench is made with a heavy hardwood top and supplied

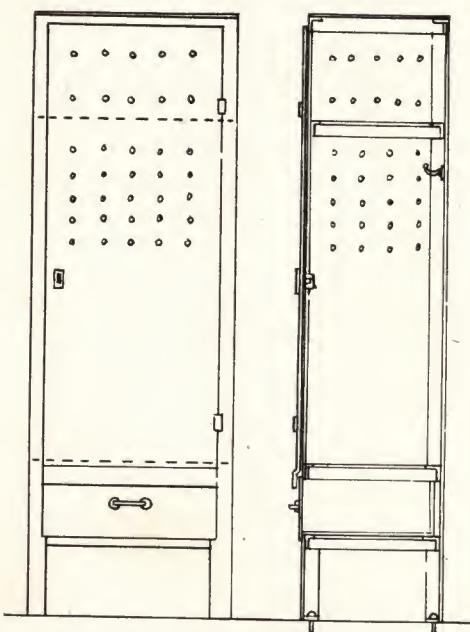


Front and End Elevations of Work Bench

another of the almost necessary parts of garage equipment. This cabinet has not only places for keeping tools which are in constant demand, but also provides space for special tools and for the storing of small parts and supplies. The lower bins

with a solid bank of drawers at one end. The other end may be fitted with drawers, or with single top drawer, as shown, with a locker below. A fairly heavy vise, preferably one which may be turned to different angles and clamped, is a necessity. A good

pair of copper protectors should be provided for holding finished surfaces in the vise.



Steel Locker

STEEL LOCKER—A good form of locker, from the standpoint of both sanitation and safety, is shown in one of the accompanying cuts. As will be seen, the locker consists of an upper closet with a drawer beneath. The perforations in the walls provide ventilation, and at the same time give warning in case of fire inside of locker.

These lockers are made either from pressed steel sheets riveted together, or from perforated or expanded metal. The fact that they can readily be washed out with a hose insures their sanitary value. The perforated sheet metal and the expanded metal lockers are more sanitary than the sheet steel form, but will not protect clothing in places where dust may settle.

ANTI-FREEZING MIXTURES—The following are rules for avoiding freezing of water in the cylinders, pipes, radiators, etc., of the cooling system of water-cooled

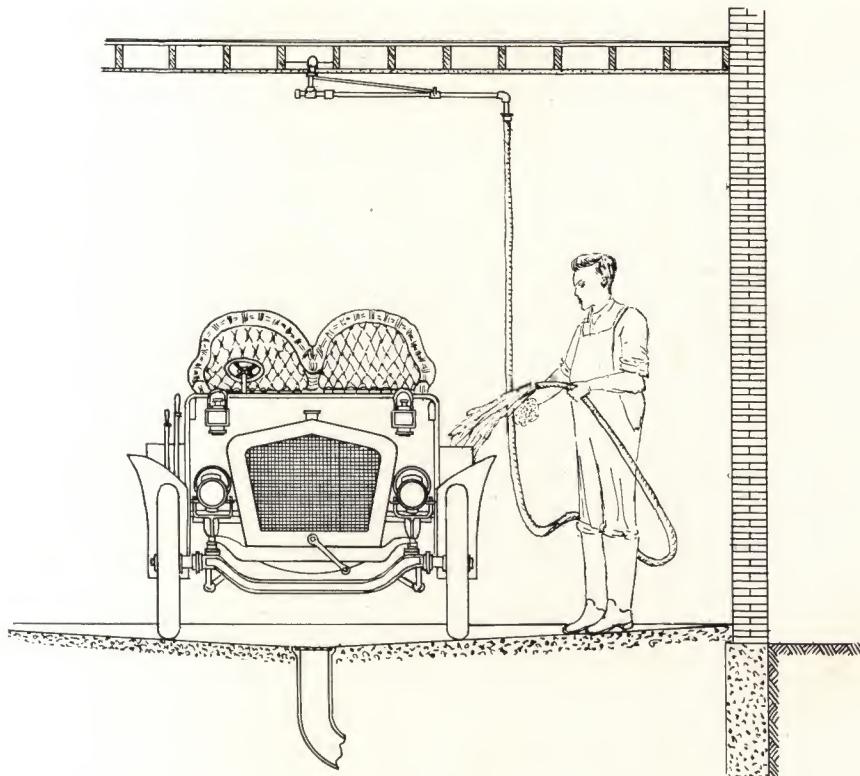
automobile engines and stationary explosive engines. As soon as freezing weather approaches or when the temperature drops as low as 40 degrees F., all water should be drained from the radiator, cylinders, and pump, and the radiator filled with one of the solutions given:

1. A mixture of glycerine and water in the proportion, by weight, of 25 per cent of the former and 70 per cent of the latter, to which is added 2 per cent of sodium carbonate.
2. Chemically pure calcium chloride, dissolved in hot water in the proportion of 4 pounds to one gallon of water.
3. Sodium chloride (common salt) or magnesium chloride, dissolved in water in the proportion of $1\frac{1}{2}$ to 2 pounds to the gallon.
4. Wood alcohol in the proportion of 20 per cent alcohol to 80 per cent of water. This solution has the advantage of being sufficient for average winter weather, and it has no ill effect of any kind on metals, nor does it leave any sediment.

Should the thermometer reach as low as 15 degrees F., a solution of about 25 per cent alcohol and 75 per cent water should be used. For temperatures below zero use 30 per cent alcohol and 70 per cent water.

SWINGING ARM HOSE ATTACHMENT—The hose attachment shown is another of the many convenient devices for the up-to-date garage. As shown in the figure, a supported bracket arm of pipe is attached by a swivel joint to the water connection in the ceiling and threaded at the end to take the hose coupling.

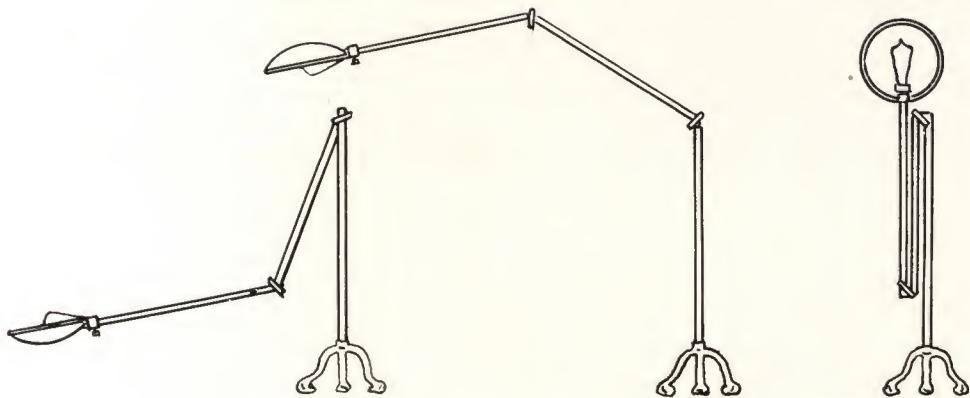
The advantage of such an arrangement is that the hose may be used directly upon any part of the machine without smearing the wet and dirty water over the body of the car, which is naturally the case when a hose has to be dragged over or around the car from one position to another. The



Swinging Arm Hose Attachment

hose is also less exposed to injury than when lying on the floor, as under this system it is kept off the floor entirely and out

FOLDING BRACKET STANDARD FOR ELECTRIC LIGHT — The device shown in the accompanying figure is very



Folding Bracket and Standard for Electric Light

of the way. Its life, too, is prolonged through the facility with which it can be drained and kept free of water when not in use.

convenient for use around a garage, especially when work is to be done under the body of the car. While compact in its folded state, it is surprising to see the twists

and turns of which this device is capable. The universal ball and socket joints by which the bracket arms are connected to the heavier standard allow great freedom of motion to the lighter arms. As seen from the figure, it is just as easy to adjust the lamp for work under the machine as it is for any other position. The heavy base provides for stability when the bracket arms are extended. An adjustable light stand of the type illustrated is comparatively inexpensive.

TURNING OIL FROM A SQUARE CAN

—A great many oil cans in which oil is sold are square, with the opening at the side or corner. The contents of such a can may be poured out without wasting a drop, if the can is held properly, with the opening at the top. This will permit the can to be tipped so that the oil will flow without a gurgle. If the can is held so that the opening is at the lower corner, the oil will try to follow down the outside of the can and cause considerable waste.

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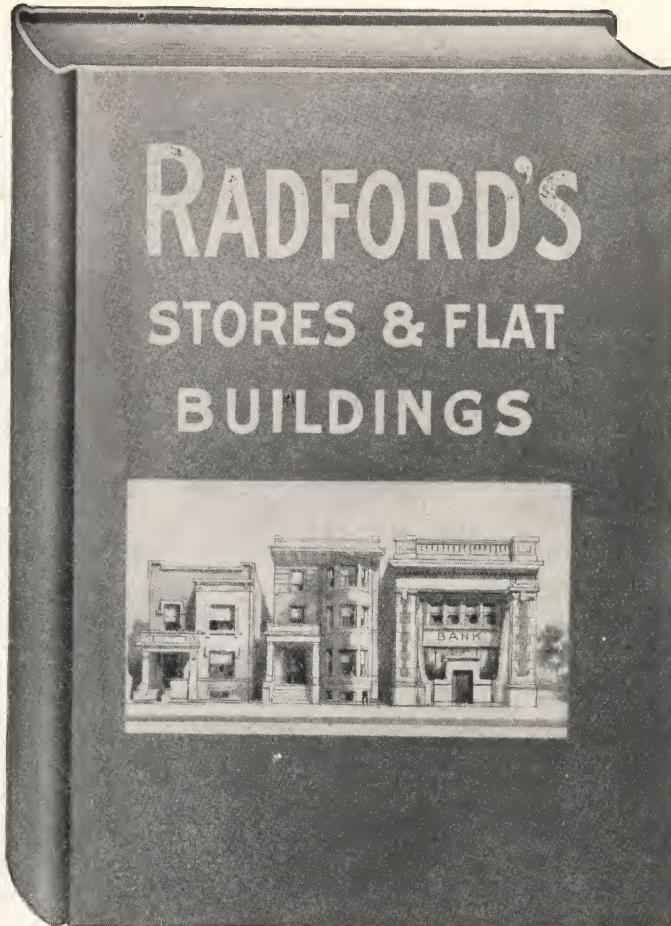


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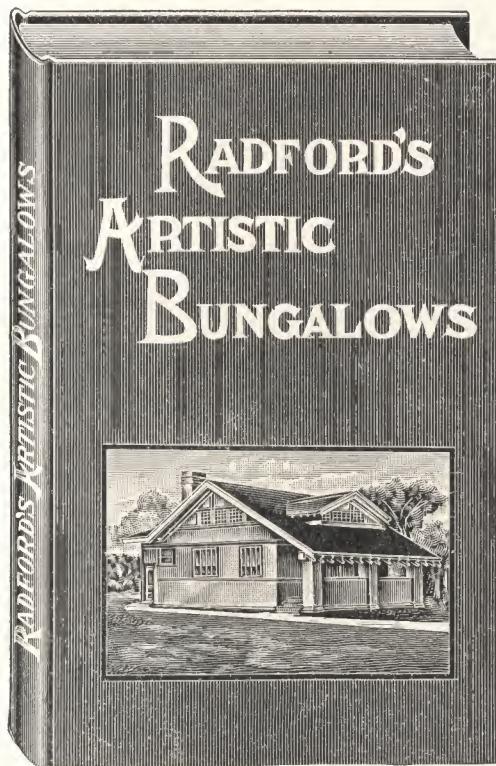
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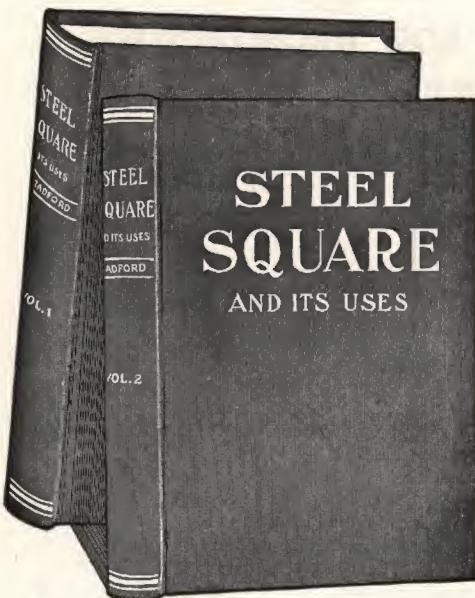
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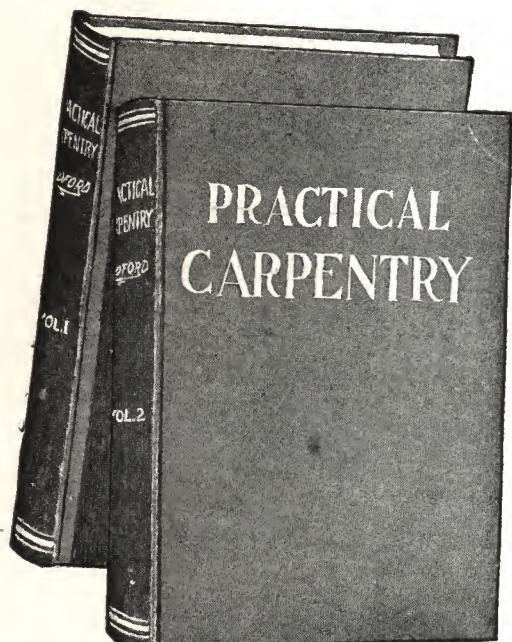
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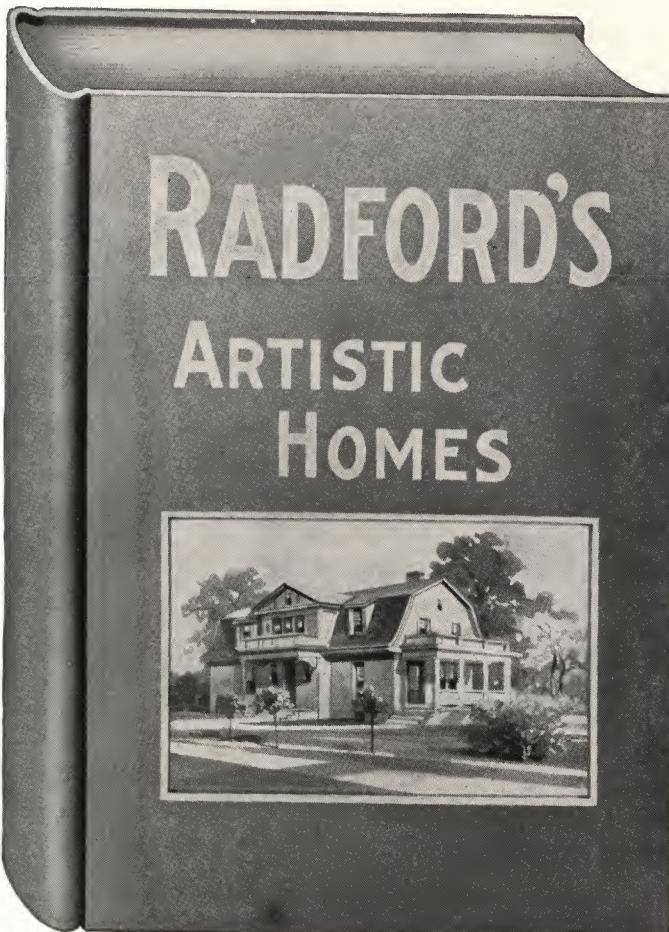
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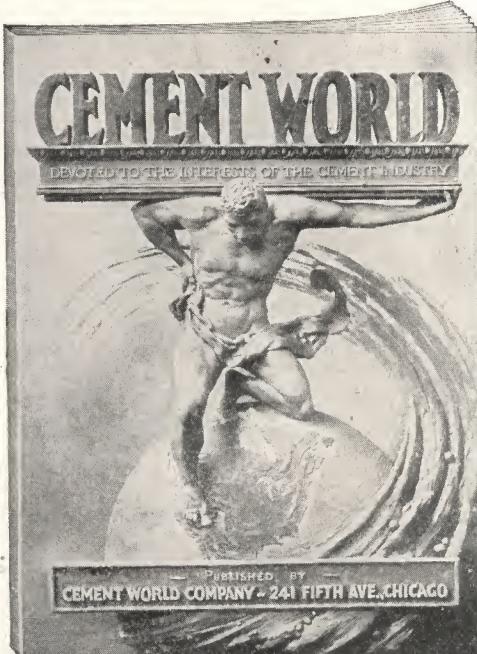
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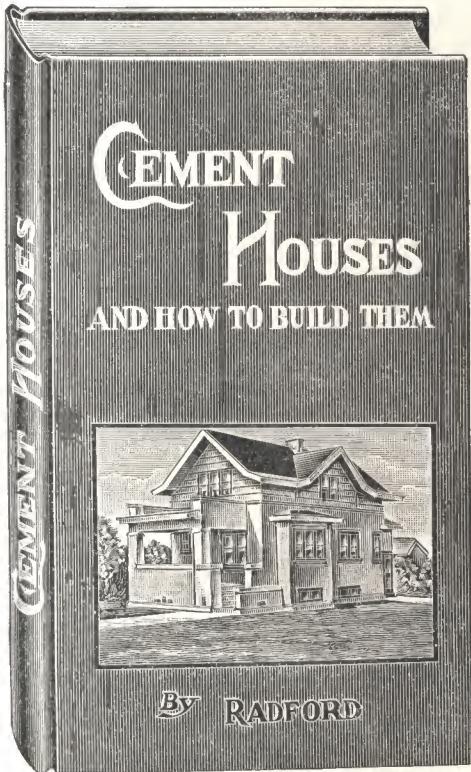
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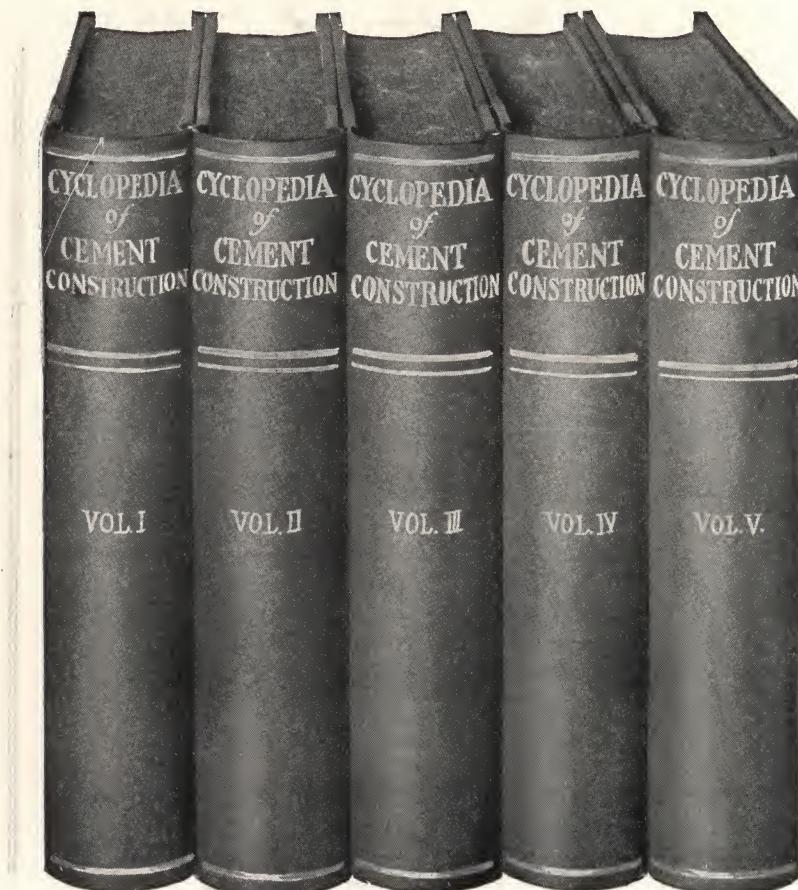
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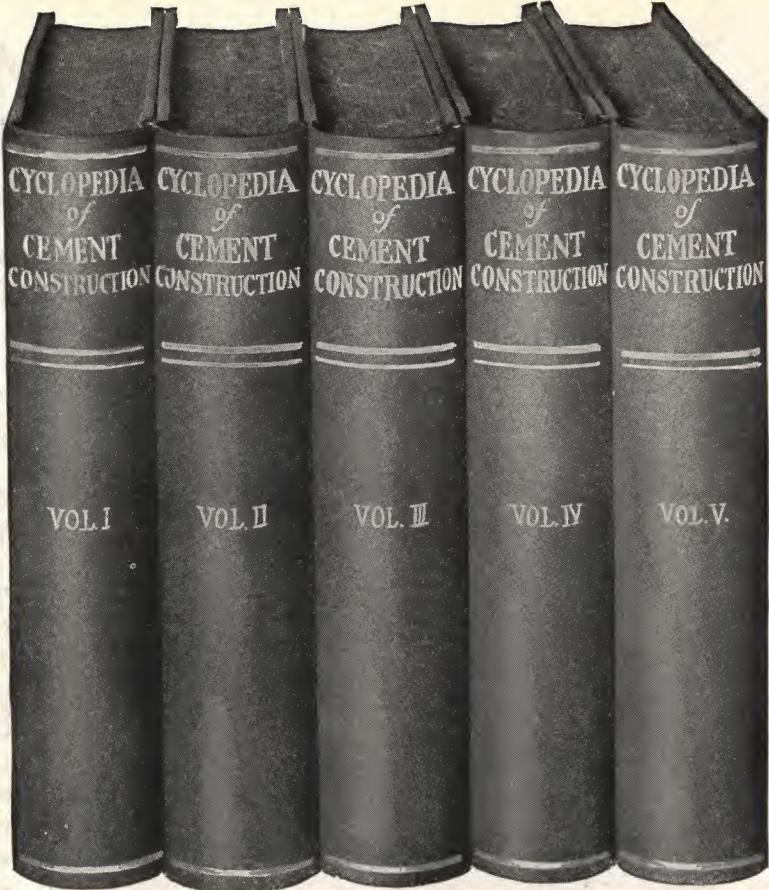
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Ideal Waterproofing Filler	The Fire Risk and Insurance
Ironite, Liquid Konkerit, Mineral Rubber	Fireproof Floors
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Petriifax, Saltsproofing	Partitions, etc.
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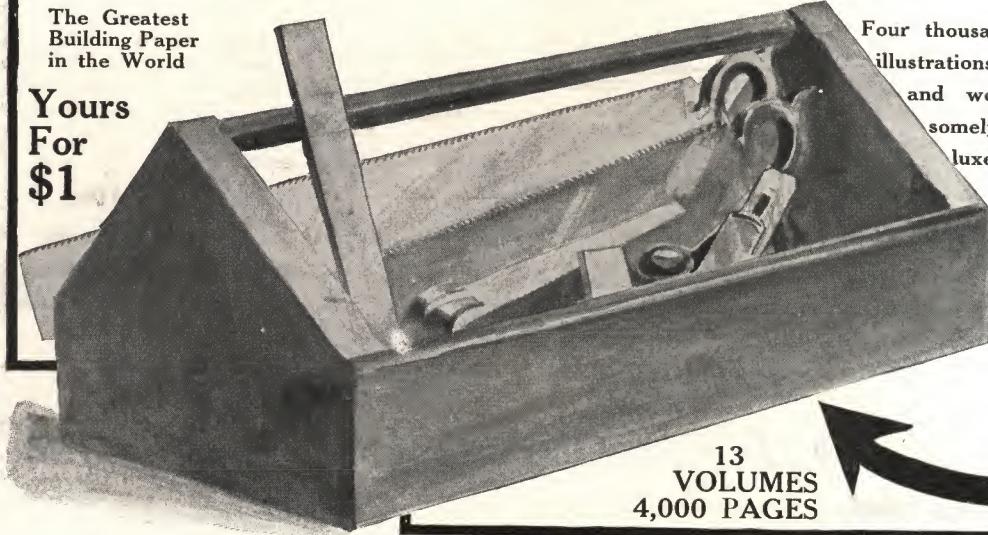
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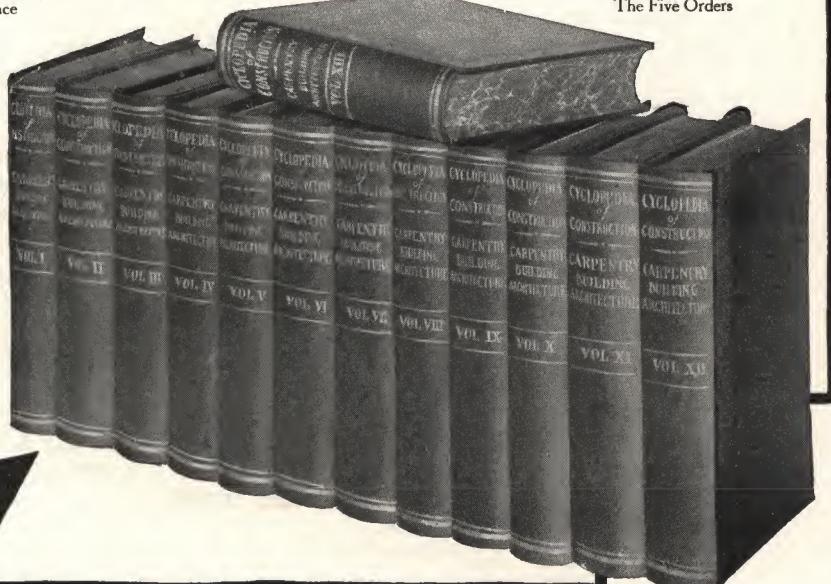
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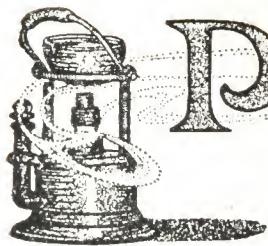
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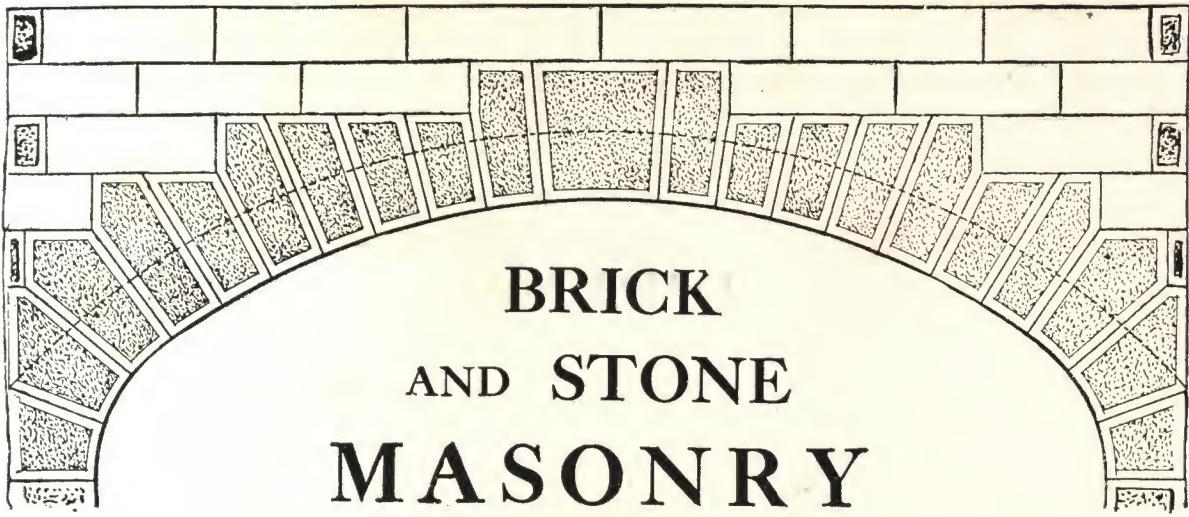
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